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All India Coordinated Research Project on Mushroom



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(Indian Council of Agricultural Research)
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Chambaghat, Solan - 173 213 (H.P.), India

ANNUAL REPORT 2015-16
All India Coordinated Research Project on Mushroom
ICAR-Directorate of Mushroom Research
Solan - 173 213, India

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Front page photos : Top to bottom
Button mushroom crop at Nauni
Paddy straw mushroom crop at Ranchi
Oyster mushroom crop at Manipur
Milky mushroom crop at Udaipur
Shiitake mushroom crop at Vellayani
Recipe from Maharashtra

Back page photos : Wild mushroom collections by DMR, Solan,
Bhunaneshwar centre, Pune centre, Jammu centre,
Pusa centre and Pantnagar centre

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PREFACE

India has achieved food security since last few decades and produced over 557 million tonnes of food grains in 2011-12. However, our struggle for nutritional security is still on. During coming decades, the increasing population, depleting agricultural land, deteriorating environment, water shortage and quality food are going to be the vital issues. Moreover, Problems of unemployment, poverty and malnutrition are inextricably inked and are acute in the vulnerable sections of the society. Obviously, these cannot be solved by conventional land based agriculture only. Creation of opportunities for enhancement of income of small farmers, landless labourers and unemployed youths by diversification of opportunities of income generation through subsidiary occupation are the new challenges. To meet these challenges, it is important to diversify agricultural activities. Mushroom cultivation recycles agro-residues, much of which is otherwise burnt in the field. In changing agricultural scenario, secondary agriculture is going to play a pivotal role and mushroom fits very well in this category. Our country can emerge as a major player in mushroom production utilizing abundant agricultural residues. Mushroom being an indoor crop, utilizes vertical space and requires only 25-30 litre water for production of one kg mushroom, thus offering a solution to shrinking agricultural land and water. It is labour intensive and high profit venture for gainful employment of the poor people. It would also provide good quality protein to fight against malnutrition and bridge the protein gap. Therefore, mushroom cultivation may go a long way in contributing significantly to the solution of the twin problem of poverty and malnutrition in developing countries.

India is blessed with a varied agro-climate, abundance of agriculture waste and manpower making it suitable for cultivation of all types of temperate, tropical and sub-tropical mushrooms. It is estimated that India is generating 700 million MT of agricultural waste besides, fruit and vegetable residue, coir dust, husk, dried leaves, prunnings, coffee husk, tea waste etc. A large amount of the agricultural waste are burnt and left in the field for composting and incorporation in the soil for fertility. In this process a large amount of potent source of organic carbon and nutrients are lost, which otherwise could be recycled back to the field as spent mushroom substrate, definitely better compost for field crops.

Mushrooms are now getting significant importance due to their nutritive and medicinal values and income generating venture in about 100 countries. At present, world mushroom production is estimated to be around 5 million tons/annum. The annual world production of button mushroom has reached 6.5 million tonnes and that of all types of mushrooms is estimated to be over 25 million tonnes and is increasing @ 7%/annum. Our country has registered twenty-fold increase in production of mushrooms in the last four decades and still our production is only 1.2 lakh tonnes. Button mushroom continues to occupy a prominent place and contributes about 80% of the total mushroom production of our country. With urbanization and increased production of agro-residues along with increased food production, there will be a need to radically change the way we look at agriculture. High-tech agriculture including mushroom cultivation is going to gain importance in coming decades.

Although, mushroom science as well as production technology has also witnessed newer innovations and applications, technology development, refinement and standardization for different agroecological region is a continuous process. Also, continuous skill upgradation of human resources will be indispensable to keep pace and to move ahead in R&D.

To achieve this goal and to promote mushroom cultivation and multilocation testing the varieties and technologies, All India Coordinated Research Project on Mushroom (AICRPM) came into existence during VI Five-Year Plan on 01.04.1983 with its Headquarters at Directorate of Mushroom Research, Solan (HP). The Director, DMR, Solan (HP) also functions as the Project Coordinator of the project. Initially the AICRP on Mushroom started with six centres viz., PAU, Ludhiana; GBPUA&T; Pantnagar; CSAUA&T, Kanpur; BCKVV, Kalyani; TNAU, Coimbatore and MPAU, Pune. During VII Plan, two existing centres at Kanpur

(UP) and Kalyani (West Bengal) were dropped and IGKV, Raipur was added as new centre. Three new centres during VIII Five Year Plan while 3 coordinating and one cooperating centres during IX Five Year Plan were added by dropping one at Goa. Four coordinating and one cooperating centres were added during XI Plan. These were: OUAT, Bhubaneswar; HAU, Hisar; RAU, Samastipur; CAU, Pasighat (coordinating centres); and HAIC, Murthal (Cooperating centre). Presently, 14 coordinating and two cooperating centres are part of AICRPM programme. During the XII five year plan 11 more coordinating and 9 cooperating centre were added and Faizabad centre was dropped. All the coordinating centres work for a common mandate of germplasm collection of native edible flora, multilocation testing of the varieties and technologies, trainings and supply of spawn to the growers. The technical programme for conducting participatory research during 2015-16 was finalized in the annual workshop organized at ICAR-DMR, Solan on 29-30 June, 2016. During the year under report, attempts were made to collect edible mushrooms in different parts of the country, evaluate promising varieties/ strains of white button mushroom, paddy straw mushroom, milky mushroom, shiitake mushroom, oyster mushroom, etc. and standardize cultivation technology of specialty mushrooms, which are needed to diversify the mushroom cultivation scenario in the country. Survey and collection of mushrooms is an important activity of AICRP Mushroom and during the period under report a large number of germplasm was collected by different centres. Most of the centres have deposited pure culture of wild germplasm in the Gene Bank of ICAR-DMR, Solan.

(Project Coordinator)

SUMMARY

All India Coordinated Research Project on Mushroom functions in a coordinated manner in association with fourteen coordinating and two cooperating centres located in different agro climatic zones of India to test and validate the technologies or to identify varieties, developed at Directorate of Mushroom Research, Solan and other centres in various regions of India to promote climate-wise mushroom cultivation in India so as to reduce the cost of cultivation. During the year under report (2015-16), the research trials were conducted at all the thirty two centres based on technical programme finalized during the annual group meeting of AICRPM workers held on 29-30 June at ICAR-DMR, Solan.

During the year 2015-16, six experiments were conducted on strainal evaluation of five different mushrooms i.e. white button mushroom (*Agaricus bisporus*), oyster mushroom (*Pleurotus* spp.), paddy straw mushroom (*Volvariella volvacea*) and milky mushroom (*Calocybe indica*) at various centres. Strain evaluation trials of white button mushroom were on advance varietal trial -1 for selected white accessions of *Agaricus bisporus*. In the trials conducted using the short method compost, the maximum yield of 27.76 kg per 100 kg of compost was recorded in the strain AVT-15-04 at Samastipur Centre followed by 24.98 kg at same centre. The strain AVT-15-03 has performed the best at all the centres giving average yield of 19.55 kg/100 kg compost. The strain AVT-14-01 performed poorly at Murthal, Ludhiana and Palampur centres but on other centres, the performance of the strain was good. Overall all the strains have performed well at all the centres barring poor performance of AVT-15-01 at some centres. The time taken in first harvest (days post casing) was in the range of 14-36 days. The lowest first harvest time (14 days) was recorded at Pantnagar in strain AVT-15-02. Overall the lowest first harvest time of 23 days was recorded in AVT-15-02 and AVT-15-03. Fruit body weight also varied at different centres and was recorded maximum (18 g) at Pune centre in the strain AVT-15-02 and AVT-14-03 (17 g) at Pune and AVT-15-02 at Pantnagar centre (Table 4.2). At headquarters the average fruit body weight ranged between 14-15 g in all the strains. On the basis of average fruit body weight, maximum fruit body weight of 15 g was recorded in strain AVT-15-02 and AVT-15-05.

A total of eight strains of *Volvariella volvacea* were tested at eight different locations. The biological efficiency of various strains varied in the range of 4.24 to 21.87 kg /100 kg of dry substrate at various centres in different strains. The maximum yield of 17.1 kg/100 kg of dry substrate was recorded in strain Vv-15-05 at Raipur. It was also recorded that the highest average biological efficiency was achieved at the Raipur, Hisar and Coimbatore centres. The minimum biological efficiency was recorded in Vv-15-07 at Coimbatore centre with an average yield of 3.66 kg /100 kg of dry substrate. Overall average showed that the maximum BE (14.08 kg) was recorded in Vv-15-02 strain while the minimum BE (9.2 kg) was in strain Vv-15-04. The average fruit body weight varied at different centres with a maximum of 25.60 g at Coimbatore centre in the strain Vv-15-06 while the minimum fruit body weight was recorded to be 5.2 g at Ludhiana centre in the strain Vv-15-03. All the strains have recorded the maximum fruit body weight at Coimbatore centre followed by Hisar centre. The maximum fruit body weight recorded at Bhubaneswar centre was 16.83 g in strain Vv-15-08. Overall average showed that the maximum fruit body weight (14.07 g) was recorded in strain Vv-15-08 while minimum (9.24 g) in Vv-15-07 strain. The minimum time taken for the first harvest was 9 days in strain Vv-15-01 at Coimbatore centre. The overall average also indicated the minimum time taken for the first harvest was in strain Vv-15-04 while the maximum time in strain Vv 15-08.

The trial on evaluation of high yielding varieties/ strains of oyster mushroom was conducted at 20 different centres. A total of six high yielding strains of *Pleurotus* species were under evaluation trial. Two trials were conducted for the experiment, one during Aug to Oct when temp ranges between 20-30°C and second during December – January when Temperature is lesser than 20°C. All the strains under testing

gave maximum biological efficiency at Coimbatore centre with a maximum BE of 131.27 kg/100 kg of dry straw in PI-15-03. Lowest BE was recorded at Bangalore centre in the strain PI-15-04. The results are presented in Table. 4.7. Overall average showed maximum average BE of 63.94 kg/100 kg straw in PL-15-06 strain. The minimum time taken for the first harvest was recorded as 14.2 days and 14.67 days at Coimbatore and Ranchi centre while maximum first harvest time of more than 40 days was recorded at Bangalore centre in all the strains tested (table 4.8). Maximum fruit body weight of 25.1g was recorded in strain PI-15-03, PI-15-04 at Barapani centre while the lowest Fruit body weight of 2.67g at Barapani centre.

Advanced varietal trail for high yielding strains of milky mushroom was allotted to eleven different Centres and five strains of milky mushroom were to be evaluated. But due to non-reciept of the cultures, all the centres could not complete the experiment. At some centres where the culture was received late, the experiment is still ongoing. Till now only three centres have completed the experiment and reported the results of the experiment. Amongst the three centres, the maximum yield of 72 kg/ 100 kg straw was obtained at the Vellayani centre in CI-15-02 strain followed by CI-15-04 strain (70.33 kg/100 kg straw) at Udaipur centre. Minimum yield of 29.44 kg/ 100 kg straw was obtained in CI-15-03 strain at Udaipur centres. Overall average showed that CI-15-04 performed the best amongst the strains tested.

Initial Varietal trial of Shiitake mushroom was allotted to six different centres and six strains of shiitake mushroom were to be evaluated. The evaluation was to be done on two substrates i.e. saw dust and wheat straw. A total of three centres have reported successful results of the experiment. The maximum biological efficiency of 76.94 kg / 100 kg of dry substrate was obtained at Pantnagar centre on wheat straw based substrate in LE-15-06 tsrain followed by LE-15-04 strain at the same centre on wheat straw. Highest biological efficiency on saw dust was recorded to be 66.89 kg /100 kg dry saw dust at pantnagar centre in LE-15-06 strain itself. Overall average biological efficiency showed that the strain LE-15-06 performed the best on both the substrates.

Experiment on evaluation of zero energy polytunnel (ZEPT) technology was assigned to three different centres i.e. Hisar, Murthal and Samastipur. A new method of compost preparation using perforated pipes inside the compost pile was developed at DMR, Solan, which do not cause any air pollution by using passive aeration. Result indicated that ZEPT compost supported the growth of *Agaricus bisporus* (U3), colonized the compost within 15 days and took 22-25 days (post casing) for 1st harvest with 23.9 kg/100 kg compost at Samastipur while 16.9 kg/100kg compost at Hisar. The ZEPT method was more suitable under Bihar condition for small farmers (Up to 100 Q straw). As regards Benefit cost ratio, the labour requirement is just ½ of the long method of composting with higher yield. Overall average yield showed 15.60 kg /100 kg compost in Zero energy poltunnel technology.

Standardization of the cultivation technology of low temperature requiring *Volvariella* sp was assigned at eight centres and one strains of *Volvariella bombycina* along with one strain of *Volvariella volvacea* was tested. The experiment was successful only at two centres i.e. Ludhiana and Coimbatore. At Ludhiana centre paddy straw bundles (each 45cm x 15cm weighing 500g) were soaked for 12-14h in 1.5% CaCO₃ mixed water to a moisture level of 65-67%. The spawn of six V. bombycina strain VB-15-06 was prepared on wheat grains. Spawn run was complete in 10 days of spawning and first harvest was made after 13 days to give 14.8 kg mushrooms/qtl dry straw. Fruit bodies were companulate with 3-5cm long stipe and 2-4cm pileus diameter. At Coimbatore centre, the spawn run took 6.8 days and first harvest was after 11.6 days. A very biological efficiency was obtained (15.31 kg/100 kg dry straw). At Bhubneshwar, Ranchi, Hisar, Raipur, Samastipur, Jammu and Sikkim centres. However, mycelia colonization could not be observed in any of the beds even 15 days after spawning. Hence, no valid conclusion could be drawn out of the trial under report. Average fruit body weight of 22.4 g was recorded in case of *V. bombycina* as compared to 19.6 g in case of *Volvariella volvacea*. At Coimbatore centre *V. bombycina* fruited much earlier than *V. volvacea*.

Different Centres have reported the collection of specimens of wild mushrooms during the year and about 365 collections have been made and a total of 206 specimens were deposited at the DMR Gene Bank with passport data and a total of 165 specimens have been assigned accession numbers. During the last workshop of AICRPM, it has been decided that different mushrooms collected and consumed locally by the people of different regions will be collected and we should take advantage of the ITK available on mushrooms and utilize this germplasm instead of going for random collection of wild germplasm. In this regard it was decided that the Centres will survey the local markets for collecting the germplasm in addition to forest forays, collect the data, make cultures and deposit these with DMR along with their photographs, dried samples and passport data.

In the post harvest technology, the experiment on collection of mushroom based recipe of the traditional origin was assigned to all centres. Almost all the centres have contributed the recipes from the tribal area or from the traditional knowledge from their area. A total of 23 recipes have been received along with their ingredients and cooking methodology.

All the centres carried out the extension activities by participating in State/National level Exhibition, Melas, Kisan Goshthies, mass communication through AIR/TV programmes, replying to letters, telephones, email and on the spot guidance during farm visits. Almost all the centres have conducted trainings for different durations for farmers, farmwomen, unemployed youths and entrepreneurs of their areas. The centres have also supplied the spawn and pure culture to promote the mushroom cultivation practice in their respective areas.

1. INTRODUCTION

To test and disseminate the technology developed at Directorate of Mushroom Research and its Centres in different agro-climatic regions of the country and popularize mushrooms as secondary agriculture along with the existing farming system, the All India Coordinated Research Project on Mushroom (AICRPM) was launched during VI Five-Year Plan on 01.04.1983 with its Headquarters at Directorate of Mushroom Research, Solan (HP). The Director of DMR, Solan (HP) also functions as the Project Co-ordinator of the project. During the XII five year plan 9 more coordinating and 8 cooperating centre were added. Faizabad centre was dropped and in place of Faizabad, CSKHPKV, Palampur is added as the coordinating centre. HAIC murthal was upgraded as coordinating centre from cooperating centre.

Initially, the All India Coordinated Mushroom Improvement Project started with six Centres. At present, 23 Coordinating and 9 co-operating Centres are working under AICRPM. These are:

State Agricultural Universities based coordinating centres

- Punjab Agricultural University, Ludhiana (Punjab)
- Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu)
- G.B. Pant University of Agriculture and Technology, Pantnagar (Uttarakhand)
- CoA, Mahatma Phule Agricultural University, Pune (Maharashtra)
- N.D. University of Agriculture and Technology, Faizabad (UP)
- Indira Gandhi Krishi Vishwa Vidyalaya, Raipur (Chhattisgarh)
- Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan)
- CoA, Kerala Agricultural University, Vellayani (Kerala)
- C.C.S. Haryana Agricultural University, Hisar (Haryana)
- Orissa University of Agriculture and Technology, Bhubaneswar (Orissa)
- Rajendra Agricultural University, Samastipur, Pusa (Bihar)
- College of Horticulture and Forestry, Central Agricultural University, Pasighat (Arunachal Pradesh)
- CSK HPKV, Palampur (HP)

State Govt based Coordinating Centre

- HAIC Murthal (Haryana)

ICAR Institute based coordinating centres

- ICAR Research Complex for NEH Region
 - ICAR Research Complex for NEH region, Barapani (Meghalaya)
 - ICAR Research Complex for NEH region, Sikkim
 - ICAR Research Complex for NEH region, Arunachal Pradesh
 - ICAR Research Complex for NEH region, Nagaland
 - ICAR Research Complex for NEH region, Manipur
 - ICAR Research Complex for NEH region, Mizoram

- o ICAR Research Complex for NEH region, Tripura
- ICAR-Research Complex for Eastern Region Research Centre, Ranchi (Jharkhand)
- ICAR-Central Island Agri. Res. Institute, Port Blair (Andaman & Nicobar Island)
- ICAR-Indian Institute of Horticultural Research, Bangalore

Co-operating Centres

- Dr.Y.S.Parmar University of Horticulture & Forestry, Nauni, Solan (HP).
- ICAR-VPKAS, Almora (Uttarakhand)
- Sher-e- Kashmir Uni.of Agri. Sci.&Technology, Srinagar (J&K)
- Sher-e- Kashmir Uni.of Agri. Sci.&Technology, Jammu (J&K)
- Assam Agri. University, Jorhat (Assam)
- Sardar Ballabh Bhai Patel Uni. Of Agri& Tech., Meerut (UP)
- Bidhan Chandra Krishi Viswavidyalaya, Nadia (WB)
- Sardarkrushinagar- Dantiwada Agri. Uni., Dantiwada (Gujrat)
- Acharya NG Ranga Agri. Uni. Rajendranagar (Hyderabad)

The last Group meeting of workers of AICRPM was held on 29-30 June, 2015 at ICAR-Directorate of Mushroom Research, Solan. During the meeting the progress of last year (2014-15) was monitored and technical programme for 2015-16 was finalized.

2. MANDATE AND OBJECTIVES



Geographical locations of different Centres of AICRP on Mushroom

The mandate of AICRP (Mushroom) is to coordinate and monitor multilocation trials with improved mushroom varieties / hybrids, cultivation practices related to crop production, crop protection measures and post harvest technology, all aimed at increasing production, productivity and utilization of mushroom in the country. Major activities under the project are:

1. To conduct survey of naturally occurring wild mushrooms, catalogue the edible/ medicinal species and explore possibilities of cultivation of promising species.
2. To evaluate the promising and high yielding strains for regional adaptability.
3. To carry multi-location trial for finalization of standard production techniques for different mushrooms.
4. To explore possibility of selection of cheaper locally available substrates for mushroom cultivation.
5. To supply good quality spawn to the mushroom growers.
6. Popularization of mushroom cultivation in different agro-eco-regions.

3. TECHNICAL PROGRAMME OF WORK FOR 2015-16

I. CROP IMPROVEMENT

Expt. 01: Collection, identification and conservation of wild edible mushrooms

- a) Participating centres All centres except Murthal
- b) Data to be recorded
- The collection may be done area wise/district wise
 - Information about local names may be collected to avoid duplication
 - Rainfall and temperature data, indicate month and season of appearance
 - Supply sun dried fruit bodies/spore prints along with cultures
 - Supply GPS data of the region from where mushroom was collected
 - Fill the enclosed proforma as much as possible. Please send the above information within two-three weeks of collection.
 - Do not send the cultures without adequate supplementary information
 - **Please ensure that the culture should not be exposed to >35°C temperature during transit. If need be, any staff may be sent along with the culture and other information.**
- c) Area of operation
- Each Centre may select different districts so as to cover whole region over period of time
- d) Proforma for market data on mushroom if collected from market

Sl.No.	Informations to be recorded	Observation/data
1.	Name/market/District	
2.	Date of collection	
3.	Sale price (Rs./kg)	
4.	Any association with tree(s)/soil type etc. (interact with collector if possible)	
5.	ITK if any	
6.	Temperature range during the collection period (15-20, 20-25, 25-30, 30-35°C)	

* Report to be sent by the end of December along with colored photograph, dried specimens and cultures and for the accessions collected between Jan to March, report to be sent by 15th April.

* When ever explorations is planned, information may be sent to Dr RC Upadhyay, Director DMR at director.mushroom@icar.gov.in and Dr Shwet Kamal at shwetkamall@gmail.com

Proforma for mushroom identification

Collector's Name:

Name of the PI:

Centre's Name:

- ☐ Specimen no.
- ☐ Date of collection
- ☐ Locality
- ☐ GPS Data
 - ☐ Longitude
 - ☐ Latitude
 - ☐ Altitude
- ☐ Single, in groups or connate (United)
- ☐ Habitat (Humus, wooden stumps or trees, dung, sand, or any other)
- ☐ Smell (Y/N)
- ☐ Spore print colour
 - ☐ Colour
 - ☐ Diameter
 - ☐ Shape
 - ☐ Scales / smooth/any other
- ☐ Stipe
 - ☐ Central, lateral or excentric
 - ☐ Colour
 - ☐ Stipe size and length
 - ☐ Stipe base
- ☐ Ring present or absent
- ☐ Volva present or absent
- ☐ Veil present or absent
- ☐ Basal association
- ☐ Lamellae (in case of gill fungi)Scale on cap: gills, tooth, tubes, pores
 - ☐ Attachement: Free, adnascad (just tocuching stem), adnate (broad by attached), Shortly decurrent (running on the stem apex)
- ☐ Gill colour
- ☐ Gill Edges
- ☐ Edibility (edible/non-edible/ medicinal/ poisonous)
- ☐ Any Other information, ITK
- ☐ Photograohs of natural specimen showing habitat and after taking out from the soil showing cap, stem, ring, gills, volva and stem base

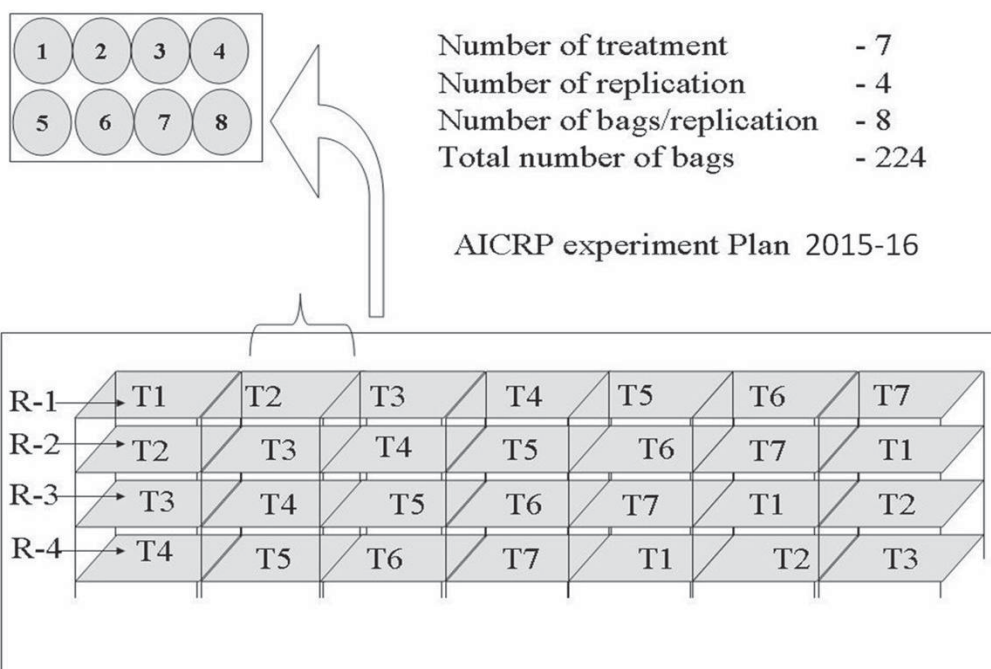
Expt. 02: Advanced varietal trial for selected white accessions of *Agaricus bisporus*

- | | |
|--|---|
| a) Participating centres | <ul style="list-style-type: none"> ● Pantnagar, Murthal, Nauni, Pune, Ludhiana, Palampur, Srinagar, Samastipur and Solan |
| b) Substrate | <ul style="list-style-type: none"> ● Substrate quantity- 8 kg compost/bag ● No. of replications- 5 replications each with 10 bags of 10 kg compost/replicate for each strain in RBD. |
| c) Strains to be evaluated | <ul style="list-style-type: none"> ● AVT-15-01 to AVT-15-05 (Cultures to be provided by September) |
| d) Methodology to be adopted | <p>Short Method</p> <ul style="list-style-type: none"> ● Preparation of compost by short method in 2 phases (phase-I and phase-II) by following standard procedure (-6, -4, 0, 2,4,6,8 (fill)/phase-II (6-7 days). Compost will be ready in 18 days. ● Ingredients to be used are wheat straw - 1000 kg, poultry manure- 500 kg, urea-15 kg, wheat bran-70 kg, gypsum-40 kg. ● Data for compost N(1.75 to 2.2%), colour, pH (7.2 to 7.8), moisture (< 60%), ammonia, bulk density (kg per m³) may be reported for each trial |
| e) Spawning rate to be used | 1 % of wet compost |
| f) Data to be recorded during 4 weeks cropping | <ul style="list-style-type: none"> ● The yield data should be recorded in tabulated form replication wise. ● The replicates should be randomized in cropping rooms in different tiers in RBD. One replicate may be kept on one tier ● Watering should be restricted to wetting of casing material. ● Casing material: FYM + SMS (2:1, v/v) both two years old (pH to be adjusted to 7.2-7.5 with CaCO₃). ● The casing material should be water leached for 8 hours before treatment with steam/chemicals. Uniform layer of casing to be applied on mycelia impregnated compost (4cm thick). ● Harvest mushrooms in button form, removing the soiled stem end with knife before weighing. Do not discard the weight of open mushrooms, but the number of mushrooms opened in each harvest should be recorded to determine the quality of the fruit body produced by a particular strain. ● Average fruiting body weight to be recorded in each treatment (Total weight of mushrooms harvested divided by No. of mushrooms harvested) to determine the quality of mushrooms produced. ● Every effort should be made to strictly adhere to the above instructions for this experiment. This will facilitate generation of uniform data for assessment and final recommendation. ● A transverse section of fruit body may be cut and may be rated on a hedonic scale of 1-5 (1 for poor and 5 for excellent). The rating may be done for gill size, pileus length, stipe thickness, firmness of fruit body, etc. Photographs of TS of each strain must be supplied. |

- g) Environmental conditions to be maintained inside cropping room
- Spawn run: Bed Temp- $24 \pm 1^\circ\text{C}$, RH-90-95%, $\text{CO}_2 > 10,000$ ppm.
 - Case run: Bed Temp- $24 \pm 1^\circ\text{C}$, RH-90-95%, $\text{CO}_2 > 10,000$ ppm.
 - Cropping: Bed Temp $16-18^\circ\text{C}$, RH 80-85%, $\text{CO}_2 < 1000$ ppm

h) Bag size 20"x24" (polythene - 150 gauge)

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com. Reporting of the experiments and results to be done to and Cultures may also be obtained from Dr. Shwet Kamal.



Experiment design for AVT-1 of *A. bisporus*

Expt. 03: Advanced varietal trial-1 for strains of Paddy Straw Mushroom, *Volvariella volvacea*

- a) Participating centres
- Coimbatore, Bhubaneshwar, Ranchi, Ludhiana, Hisar, Raipur, Manipur, Mizoram
- b) Substrate
- Paddy straw bundles (45 cm x 15 cm) – 500 g each soaked for 12-14 hours in CaCO_3 mixed water (@1.5%)
- c) Method
- Bundle method (3 bundles ´ 4 layers + 1 bundles opened at the top) with plastic sheet covering for whole cropping period (tight during spawn run and loosely during cropping) with intermittent water spray on mushroom beds
 - Bed Size 1.5 x 1.5 x 1.5 cubic ft (Preferably)
- d) Strains
- Vv-15-01 to Vv-15-08 (two from Bhubneshwar centre and 6 from DMR, Solan)
- e) Replication
- 4 replications each with 3 beds for each strain
- f) Data to be recorded
- Substrate moisture
 - Substrate temperature during spawn run, pinning and cropping

- Relative humidity during cropping
- Time taken for mycelial colonization of the substrate
- Time taken for first harvest (days post-spawning)
- Mushroom yield weekly (kg/100 kg dry substrate) for 2 weeks cropping period
- Average fruiting body weight
- Incidence of diseases/insect-pests, if any
- Fruiting body quality of unopened mushroom (length, breadth, shape, colour and dry weight)
- Enclosure of Anova with data sheet

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; ahlawat22op@gmail.com. Reporting of the experiments and results to be done to and cultures may also be obtained from Dr. O P Ahlawat.

Expt. 04: Evaluation of high yielding varieties/strains of Oyster Mushroom (*Pleurotus* spp)

- | | |
|-----------------------------|--|
| a) Participating centres | <ul style="list-style-type: none"> ● Pune, Raipur, samastipur, Pasighat, Pantnagar, Vellayani, Coimbatore, Bhubaneshwar, Udaipur, Hisar, Ranchi, Barapani, Manipur, Kalyani, Port Blair, Bangalore, Jammu, Srinagar, Sikkim, Mizoram, Palampur |
| b) Substrate | <ul style="list-style-type: none"> ● Wheat straw or paddy straw ● Presoaking for 4 h for wheat straw; and 2 h for paddy straw ● Substrate treatment: Hot water treatment 65°C for 30 min for paddy straw and 1 h for wheat straw ● Dry for minimum 4 h under open ● pH to be adjusted to 7.50 with CaCO₃ ● Substrate quantity: 1 kg dry wt. (with 70 % moisture)/bag ● No of replications: 5 replication each with 6 bags and all bags of one replication to be placed in one tier (RBD) |
| c) Containers | <ul style="list-style-type: none"> ● Polybag (30 x 45 cm) |
| d) Season for laying trials | <ul style="list-style-type: none"> ● Two trials during Sept Oct and March-April of all the strains ● Temp range – 25-30°C |
| e) Spawn rate | <ul style="list-style-type: none"> ● 500g spawn for 5 kg dry substrate |
| f) Varieties | <ul style="list-style-type: none"> ● Six new strains of <i>Pleurotus</i> – PL-15-01 to PL-15-06 |
| g) Data to be recorded | <ul style="list-style-type: none"> ● Days taken for spawn run. ● Days taken for pinhead formation. ● Yield data (number and weight up to 4 weeks). ● Time taken for I, II and III flush |

- Data of maximum and minimum temp and dry and wet bulb thermometer readings of the morning 10.00AM must be supplied with yield data. Results will not be considered without this data.
 - Fruit body observations of individual hybrid strain
 - Pileus size, colour, stipe length, stipe thickness, organoleptic tests - liking of the consumers and coloured photograph of each strain.
 - The data on pileus and stipe size/thickness are to be recorded for at least 10 fruit bodies
 - Pest and disease incidence (as per proforma)
 - Photographs of each hybrid
- h) Information to be provided
- Substrate used and substrate preparation method (**Important**)
 - Date of spawning
 - Date of opening bags
 - Max. and minimum temperature and RH% in the cropping rooms
 - (Separate sheet is enclosed for recording)
 - Daily yield record (replication wise)

Table 1. Cropping room temperature and RH (%) Data

Date	Temperature (°C)		RH (%)	Remarks (bag opening, pinhead formation, 1 st harvest, etc)
	Maximum	Minimum		

Table 2. Mushroom yield data; Substrate (wheat or paddy straw)

Strain	Replication	Yield (g) of each bag	Total Yield (g)
PF-1	R-1R5		

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; rc_upadhyay@hotmail.com. Reporting of the experiments and results to be done to and Cultures may also be obtained from Dr. R. C. Upadhyay.

Expt. 05. Advanced varital trial for high yielding strains of Milky mushroom (*Calocybe indica*)

- a) Participating centres
- Coimbatore (PS), Raipur (WS), Samastipur (WS/PS), Pantnagar (WS), Murthal (WS), Udaipur (WS), Meerut (WS), Hisar (WS), Orissa (PS), Vellayani (PS), Pune (WS)
- WS = Wheat straw; PS = Paddy straw**
- b) Strain
- CI-15-01 to CI-15-05
- c) Substrate
- Wheat straw/paddy straw
- d) Supplement
-

- | | |
|---|--|
| e) Method of substrate preparation | ● Hot water treatment (presoaking the wheat/paddy straw for 4h followed by boiling the straw bits for 30-45 min at 80°C. The substrate is shade dried to maintain 60-65% moisture at the time of bag filling) |
| f) Spawn rate | ● 4% (on wet weight basis) |
| g) No. of replication | ● 4 replication of 6 bag each |
| h) Bag size | ● 3.0 kg wet weight (60 x 30 cm and after spawn run cut in to half) |
| h) Observation to be recorded | ● Days to spawn run; days to first harvest, no. of fruit bodies and total yield per bag; total yield per 100 kg dry substrate |
| i) Production technology to be followed | <ul style="list-style-type: none"> ● Treat the substrate with hot water (65°C for 30 min for paddy straw and 1 h for wheat straw) ● Method of spawning – layer spawning 4% wet weight basis ● Spawn run temp – 28-30°C; RH – 80%; Light – diffused ● Takes 20 days for substrate colonization and then casing is to be done. ● Casing – 75% soil and 25% sand (clay loam soil with pH around 8.0) ● Thickness – 2.0-2.5 cm; pH – 8.0 to be adjusted with chalk powder ● Casing autoclaved for 1 h about a week in advance. ● Apply 1 kg casing on each half of the bag ● Temp – 30-35°C ; RH – 80-90% maintained throughout cropping cycle ● Cropping – It takes about 10 days for case run and then minimum 3-4 air exchanges per hour required. ● Light to be provided for maximum duration during entire cropping cycle. |

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com ; sharma_vp93@rediffmail.com. Reporting of the experiments and results to be done to and Cultures may also be obtained from Dr. V P Sharma.

Expt – 06: Initial Varietal trial of Shiitake mushroom

- | | |
|------------------------------------|---|
| a) Participating centres | ● Murthal, Vellayani, Bangalore, Pantnagar, Samastipur and Solan |
| b) Strain | ● LE-15-01 to LE-15-10 (4 Strains from Vellayani, 2 from Bangalore, and 4 from Solan) |
| c) Substrate | <ul style="list-style-type: none"> i) Saw dust (Broad leaved hard wood trees) ii) Wheat straw |
| d) Supplement | ● Wheat bran @ 20% and treatment with 1% CaCO ₃ on dry weight basis |
| e) Method of substrate preparation | ● Autoclaving |
| f) Spawn rate | ● 5% (on wet weight basis) |

- | | |
|---|--|
| g) No. of replication | ● 4 replication of 6 bag each |
| h) Bag size | ● 2.0 kg wet weight |
| h) Observation to be recorded | ● Days to spawn run; days to first harvest, no. of fruit bodies and total yield per bag; total yield per 100 kg dry substrate |
| i) Production technology to be followed | <ol style="list-style-type: none"> 1. Take 40kg hard wood broad leaved trees' saw dust 2. Add water (55%) for thorough wetting overnight 3. Add wheat bran and thoroughly mix 4. Fill in polypropylene bags 2kg each and put ring and cotton plug 5. Autoclave at 126°C for 1 hour 6. On cooling spawn aseptically @ 5% wet weight basis. 7. Incubate at 24°C 8. After completion of spawn run (about 60 days) allow them to turn brown. 9. Remove the PP bags and dip the blocks in chilled water (4-5°C) for about 10 minutes. 10. Keep the block for fruiting at <20-22°C 11. Give rest 2-3 weeks 12. Repeat 9-10 steps again. |

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com ; sharma_vp93@rediffmail.com. Reporting of the experiments and results to be done to and Cultures may also be obtained from Dr. V P Sharma.

II. CROP PRODUCTION

Expt. 07: Evaluation of zero energy poly tunnel technology

- | | |
|------------------------------------|---|
| a) Participating centres | ● Hisar, Murthal, samastipur, Solan |
| b) Strain | ● U-3 |
| c) Substrate and Supplement | <ul style="list-style-type: none"> ● Wheat straw - 1000 to 1200 kg ● Chicken manure - 600 kg ● Wheat bran - 100 kg ● Gypsum - 76 kg ● Urea - 24 kg |
| d) Method of substrate preparation | <ul style="list-style-type: none"> ● Pre-wetting : Two days ● 0 day : Mixing of fine ground chicken manure, wheat bran, urea and gypsum for 6-8 h and Pile formation using ZEPT structure and covering with polythene cover |

- 1st -5th day : compost pile as such
: First three days, fully covered with polythene sheet (1st pasteurization, average temperature 66-78°C)
: fourth day onwards, side cover need to be opened (1st conditioning, average temperature 50-60°C)
- 6th day : first turning; pile formation using ZEPT structure and polythene cover
- 6th – 10th day : compost pile as such
: Seventh and eighth day, fully covered with polythene sheet (2nd pasteurization, average temperature 60-68°C)
: 9th day onwards, side cover need to be opened (2nd conditioning, average temperature 50-56°C)
- 11th day : Second turning; pile formation using ZEPT structure and polythene cover without closing side cover
: (3rd conditioning, average temperature 48-52°C)
- 13th day : pile break up and over night cooling
- 14th day : Spawning
- e) Spawn rate ● 0.7% of wet compost
- f) No. of replication ● 3 replications each with 4 bags of 10 kg
- g) Bag size ● 8 kg compost per bag
- h) Production technology to be followed ● The yield data should be recorded in tabulated form replication wise.
- The replicates should be randomized in cropping rooms in different tiers in RBD.
- Watering should be restricted to wetting of casing material.
- Casing material: FYM + SMS (2:1, v/v) both two years old (pH to be adjusted in the range of 7.2-7.5 with CaCO₃).
- The casing material should be water leached for 8 hours before treatment with steam/chemicals. Uniform layer of casing to be applied on mycelia impregnated compost, with use of 4cm wide metal rings (4cm thick).
- Harvest mushrooms in button form, removing the soiled stem end with knife before weighing. Do not discard the weight of open mushrooms.
- Every effort should be made to strictly adhere to the above instructions for this experiment. This will facilitate generation of uniform data for assessment and final recommendation.
- h) Observation to be recorded ● Composting: Daily temperature profile
- Finished compost
- Moisture content, Ph, EC, N

- Spawn run
- Days required for spawn run completion
- Presence of pest and disease if any
- Case run
- Days required for case run completion
- Presence of pest and disease if any
- The number of mushrooms opened in each harvest should be recorded to determine the quality of the fruit body produced by a particular strain.
- Average fruiting body weight to be recorded in each treatment (Total weight of mushrooms harvested divided by No. of mushrooms harvested) to determine the quality of mushrooms produced and ultimately the dry weight of the mushroom.
- A transverse section of fruit body may be cut and may be rated on a hedonic scale of 1-5 (1 for poor and 5 for excellent). The rating may be done on the basis of gill size, pileus length, stipe thickness, firmness of fruit body etc. Photographs of TS of each strain must be supplied.

Design of the Structure

- For design either visit DMR

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; ahlawat22op@gmail.com. Reporting of the experiments and results to be done to and cultures may also be obtained from Dr. O P Ahlawat.

Expt. 08. Standardization of the cultivation technology of low temperature requiring *Volvariella* sp.

- | | |
|--------------------------|---|
| a) Participating centres | ● Raipur, Coimbatore, Bhubaneswar, Ranchi, Ludhiana, Samastipur, Jammu, Sikkim |
| b) Substrate | ● 1.5% CaCO ₃ mixed water soaked paddy straw bundles (45 cm ´ 15 cm) for 12-14 hours |
| c) Method | ● Bundle method (3 bundles x 4 layers + 1 bundles opened at the top) with plastic sheet covering for whole cropping period (tight during spawn run and loosely during cropping) with intermittent water spray on mushroom beds

Spiral/outdoor method |
| d) Strains | ● 1 strain of <i>Volvariella bombycina</i> + 1 high yielding strain of <i>V. volvacea</i> (Vv-15-11 and Vv-15-12) |
| e) Replication | ● 5 replications each with 4 beds for each strain |
| f) Cropping conditions | ● To be conducted in the month of November-December or February-March (spawn run at 28 ± 2°C, cropping at 24 ± 2°C, RH 80-85%) |

- g) Data to be recorded
- Substrate moisture
 - Substrate temperature during spawn run, pinning and cropping
 - Relative humidity during cropping
 - Time taken for mycelial colonization of the substrate
 - Time taken for first harvest (days post-spawning)
 - Mushroom yield weekly (kg/100 kg dry substrate) for 2 weeks cropping period
 - Average fruiting body weight
 - Incidence of diseases/insect-pests, if any
 - Fruiting body quality of unopened mushroom (length, breadth, shape, colour and dry weight)
 - Shelf life of fruit bodies on storage at $4 \pm 2^{\circ}\text{C}$ in refrigerator
 - Organoleptic test of the popular mushroom based dish of the region
 - Enclosure of Anova with data sheet

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; ahlawat22op@gmail.com. Reporting of the experiments and results to be done to and cultures may also be obtained from Dr. O P Ahlawat.

III. CROP PROTECTION

Expt. 09. Evaluation of different bacterial isolates and effect of pre spawning of casing soil prior to pasteurization on survival / inoculums of *Mycogone perniciosus*

- a) Participating centres
- Samastipur
- Test only where the disease exists at farmer's field
- b) Substrate
- Substrate quantity- 8 kg compost/bag
- No. of replications- 3 replications each with 4 bags of 10 kg compost/replicate for each strain in RBD.
- c) Strains
- U-3
- d) Treatment
- Pre-spawning of casing soil mixture with grain spawn, liquid spawn, spawn run compost and grinded mushroom and incubation at $25 \pm ^{\circ}\text{C}$ for 10 days and then pasteurization.

Pre-spawning treatments: (Treatments 1-4)

- T-1- Grain spawn @ 0.7% + *Mycogone* @ 0.1%
 T-2- Liquid spawn @ 0.5 % + *Mycogone* @ 0.1%
 T-3- Spawn run compost @ 2% + *Mycogone* @ 0.1%
 T-4- Grinded mushroom 0.5% + *Mycogone* @ 0.1%

Treatments after casing (Treatments 5-9)

- T-5- B-9 @ 10^6 - 10^7 cfu/ml/bag+ *Mycogone* @ 0.1%
 T-6- B-18 @ 10^6 - 10^7 cfu/ml/bag+ *Mycogone* @ 0.1%

T-7- B-18 + B-9 @ 10^6 - 10^7 cfu/ml/bag+ *Mycogone* @ 0.1%
 T-8- B-20 @ 10^6 - 10^7 cfu/ml/bag+ liquid spawn @0.5% *Mycogone* @ 0.1%
 T-9- B-9+B-18+B20 @ 10^6 - 10^7 cfu/ml/bag (uninoculated)
 T-10- uninoculated pasteurized casing soil (Control-1)
 T-11- Fresh casing soil (unpasteurized) (Control-2)
 T-12- Fresh pasteurized inoculated (*Mycogone* @ 0.1) casing soil (Control-3)

- e) Spawning rate to be used ● 0.7% of wet compost
- f) Replication ● 4 (4 bags each)
- g) Data to be recorded during 4 weeks cropping ● Efficacy/ yield loss/ disease incidence
- h) Bag size ● 20"x24" (polythene - 150 gauge)

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; vpsharma93@gmail.com . Reporting of the experiments and results to be done to and Cultures may also be obtained from Dr. Shwet Kamal.

- pH of the casing soil may be adjusted to 7.5 with CaCO_3
- Layout as per AVT on button

IV. POST HARVEST TECHNOLOGY

Expt-09. Reporting of unique mushroom recipes of your area

Participating centres: All

1. Identification of a typical mushroom based recipe of local region.
2. Formulation and list of ingredients with proportion
3. Step-wise processing technology/cooking methodology.
4. Nutritional evaluation of the product
5. Photographs of the recipe

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; Bindvi@gmail.com . Reporting to be done to Ms. Bindvi Arora.

V. EXTENSION

Expt- 10. Generation of databases of mushroom farmers, spawn producers and total production of spawn and mushroom in your state

Participating centres: All

Note: The project coordinator, Scientist Incharge-AICRP and the concerned scientist must be informed 15 days before the start of the experiment at these emails: director.mushroom@icar.gov.in; shwetkamall@gmail.com; ygautamdmr@gmail.com. Reporting to be done to Dr. Yogesh Gautam.

VI. ACTIVITIES

1. Organization of at least 3 training programmes of 3-7 days duration each preferably in March, August and October months of the year.
2. Involvement of women in training programmes to empower them and help in creation of self held groups and candidates from lower.
3. Organization of two field days at the farm of the progressive farmer.
4. Active participation in Workshops, Kisan-mela and Demonstration etc.
5. Development of mushroom museum
6. Supply of quality mushroom spawn to mushroom growers mentioning the quantity.
7. Feedback on diseases of respective areas
8. Impact analysis of training programmes and spawn supply data in kg instead of packet
9. Publication of Bulletins in regional languages
10. Spawn sold in each quarter must be intimated in quarterly report.

Notes:

1. **The experiments may be laid by following proper randomization and the randomization plan may be attached with results.**
2. **The daily temperature and humidity data may be submitted in excel sheet.**
3. **The replication-wise rough data may be submitted within 15 days after completion of the trial.**
4. **Cultures supplied are coded differently each year. Please do not use the old cultures for trials. Material transfer agreement will be supplied and the same may be returned after signing.**
5. Please go through the contents above and in case of any modifications or suggestions, you may write to director.mushroom@icar.gov.in.
6. **In case of no comments from your side, the technical programme may be treated as final.**

4. RESEARCH PROGRESS

4.1 Advanced varietal trial for selected white accessions of *Agaricus bisporus*

This experiment was conducted on short method pasteurized compost at Pune, Pantnagar, Nauni, Ludhiana, Palampur, Murthal, Samastipur and Solan while was conducted on long method compost at Srinagar. The sample size of the experiment was four replications of ten bags each of 10 kg compost in RBD. The parameters of compost i.e. pH, Nitrogen, moisture and colour were also recorded. In the trials conducted using the short method compost, the maximum yield of 27.76 kg per 100 kg of compost was recorded in the strain AVT-15-04 at Samastipur Centre followed by 24.98 kg at same centre. The strain AVT-15-03 has performed the best at all the centres giving average yield of 19.55 kg/100 kg compost. The strain AVT-14-01 performed poorly at Murthal, Ludhiana and Palampur centres but on other centres, the performance of the strain was good. Overall all the strains have performed well at all the centres barring poor performance of AVT-15-01 at some centres (Table 4.1).

Table 4.1. Yield of different strains of white button mushroom on long method compost in four weeks cropping

<i>A. bisporus</i> strain	Pantnagar	Ludhiana	Murthal	Pune	Solan	Nauni	Palampur	Samastipur	Average
AVT-15-01	17.79	9.87	3.3	17.39	17.50	19.99	6.6	23.56	14.50
AVT-15-02	13.27	13.62	9.4	21.50	16.80	21.93	10.0	24.98	16.44
AVT-15-03	22.71	20.85	16.0	19.27	18.50	23.76	12.3	23.04	19.55
AVT-15-04	19.82	18.25	12.7	16.48	17.70	22.67	10.0	27.76	18.17
AVT-15-05	20.40	11.20	11.0	21.12	14.00	20.49	11.5	22.97	16.59
CD (0.05)	2.09	0.85	1.23	1.36	1.32	1.88	—	1.14	

The time taken in first harvest (days post casing) was in the range of 14-36 days. The lowest first harvest time (14 days) was recorded at Pantnagar in strain AVT-15-02. Overall the lowest first harvest time of 23 days was recorded in AVT-15-02 and AVT-15-03 (Table.4.2).

Table 4.2. Time taken to first harvest and average fruit body weight in *A. bisporus* strains

<i>A. bisporus</i> strain	Pantnagar		Ludhiana		Murthal		Pune		Solan		Nauni		Palampur		Samastipur		Average	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
AVT-15-01	19	14	24	14	21	14	22	16	24	14	25	10	22	13	34	14	24	14
AVT-15-02	14	17	24	15	24	13	19	18	22	14	24	10	22	13	35	15	23	15
AVT-15-03	17	16	22	16	20	11	22	17	26	14	23	9	22	12	35	17	23	14
AVT-15-04	20	15	23	14	23	12	22	14	24	15	25	10	22	13	35	16	24	14
AVT-15-05	19	17	25	13	20	14	20	18	24	15	24	11	22	13	36	16	24	15

a. First harvest (days post casing); b. average fruit body wt (g)

Fruit body weight also varied at different centres and was recorded maximum (18 g) at Pune centre in the strain AVT-15-02 and AVT-14-03 (17 g) at Pune and AVT-15-02 at Pant nagar centre (Table 4.2). At headquarters the average fruit body weight ranged between 14-15 g in all the strains. On the basis of average fruit body weight, maximum fruit body weight of 15 g was recorded in strain AVT-15-02 and AVT-15-05.

The compost parameters recorded at various centres have indicated that the pH of the compost ranged from 7.1 to 7.6 while nitrogen percent was varied from 1.8 to 2.4. The moisture percent varied from 58- 68% (Table 4.3). Colour of compost was invariably dark brown at all the centres. The parameters indicated that there was slight variation in the values but overall the parameters were well within the recommended range.

Table 4.3 Compost parameters for short method compost

Centres	pH	Nitrogen (%)	Moisture (%)	Colour
Pune	7.4	2.1	62	Dark brown
Pantnagar	7.1	1.98	66	Dark brown
Murthal	7.43	2.0	64	Dark brown
Ludhiana	7.5	2.4	67	Dark brown
Nauni	7.25	2.2	63	Dark brown
Solan	7.7	2.1	58	Dark brown
Palampur	7.6	1.8	68	Dark brown



Fig. 4.1. Button mushroom strain AVT-03 at Pantnagar Centre



Fig. 4.2. AVT 03 crop at Murthal Centre



Fig. 4.3 AVT-03 crop at Nauni centre



Fig. 4.4. AVT trial photographs at Pune centre



Fig. 4.5. AVT trials at Ludhiana Centre



Fig. 4.6. AVT trial at Palampur centre



Fig. 4.7. AVT-15-03 crop at DMR

4.2 Advanced varietal trial-1 for strains of Paddy Straw Mushroom, *Volvariella volvacea*

The trial was assigned at eight centres and a total of eight strains of *Volvariella volvacea* were tested. Out of eight centres only six could report successful results. At Manipur and Mizoram centre the trials could not be laid because of non-receipt of culture. The biological efficiency of various strains varied in the range of 4.24 to 21.87 kg /100 kg of dry substrate at various centres in different strains. The maximum yield of 17.1 kg/100 kg of dry substrate was recorded in strain Vv-15-05 at Raipur. It was also recorded that the highest average biological efficiency was achieved at the Raipur, Hisar and Coimbatore centres. The minimum biological efficiency was recorded in Vv-15-07 at Coimbatore centre with an average yield of 3.66 kg /100 kg of dry substrate. Overall average showed that the maximum BE (14.08 kg) was recorded in Vv-15-02 strain while the minimum BE (9.2 kg) was in strain Vv-15-04 (Table 4.4).

Table. 4.4. Yield of different strains of Paddy Straw Mushroom, *Volvariella volvacea* (kg/100kg of dry substrate)

Strain	Coimbatore	Ludhiana	Bhubaneswar	Ranchi	Raipur	Hisar	Average
Vv-15-01	12.90	15.3	11.33	7.50	16	11.2	12.37
Vv-15-02	15.16	11.8	10.83	16.16	16.7	13.8	14.08
Vv-15-03	13.61	15.7	9.70	7.50	14.2	10.7	11.90
Vv-15-04	5.84	5.7	—	9.16	13.8	11.5	9.20
Vv-15-05	6.05	12.7	12.85	12.16	17.1	13.6	12.41
Vv-15-06	17.01	8.0	13.70	10.83	7.2	12.0	11.46
Vv-15-07	3.66	6.4	—	5.66	16	15.6	9.46
Vv-15-08	12.90	8.3	9.73	—	16.7	12.1	11.95
CD(0.05)	3.34	0.9	1.22	0.27	—	1.6	

The average fruit body weight varied at different centres with a maximum of 25.60 g at Coimbatore centre in the strain Vv-15-06 while the minimum fruit body weight was recorded to be 5.2 g at Ludhiana centre in the strain Vv-15-03. All the strains have recorded the maximum fruit body weight at Coimbatore centre followed by Hisar centre. The maximum fruit body weight recorded at Bhubaneswar centre was 16.83 g in strain Vv-15-08. Overall average showed that the maximum fruit body weight (14.07 g) was recorded in strain Vv-15-08 while minimum (9.24 g) in Vv-15-07 strain.

The minimum time taken for the first harvest was 9 days in strain Vv-15-01 at Coimbatore centre. The overall average also indicated the minimum time taken for the first harvest was in strain Vv-15-04 while the maximum time in strain Vv 15-08 (Table 4.5).

Table 4.5. Average fruit body weight (g) and time taken to first harvest in strains of paddy straw mushroom

Strain	Coimbatore		Ludhiana		Bhubaneswar		Ranchi		Raipur		Hisar		Average	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Vv-15-01	20.15	9	7.7	11	11.09	14	7.5	—	—	27	13.6	10.6	12.01	14.32
Vv-15-02	20.20	11	6.8	12	12.11	15	7.64	—	—	25	13.7	10.8	12.09	14.69
Vv-15-03	22.98	13	5.2	10	10.55	16	6.33	—	—	26	14.4	10.2	11.89	15.04
Vv-15-04	17.80	17	6.2	17	-	-	10.58	—	—	—	13.5	12.0	9.62	11.50
Vv-15-05	18	18	8.1	13	15.40	14	11.2	—	—	28	12.9	13.9	13.12	17.38
Vv-15-06	25.60	11	7.8	14	11.17	13	9.48	—	—	25	13.3	12.5	13.47	15.10
Vv-15-07	19.00	21	5.8	18	-	-	8.09	—	—	—	13.3	16.9	9.24	13.98
Vv-15-08	17.25	15	8.2	14	16.83	18	—	—	—	29	14.0	12.8	14.07	17.76
CD(0.05)	2.09	3.04			1.91	0.25					NS	NS		

a: average fruit body wt (g); b: time taken for first harvest (days)



Fig. 4.7. Paddy straw mushroom AVT Trials at Ludhiana Centre



Fig. 4.8. Paddy straw mushroom AVT Trials at Bhubaneswar Centre



Fig. 4.9. Paddy straw mushroom AVT Trials at Ranchi Centre



Fig. 4.10. Paddy straw mushroom AVT Trials at Raipur Centre

4.3 Standardization of the cultivation technology of low temperature requiring *Volvariella* sp

The trial was assigned at eight centres and one strains of *Volvariella bombycina* along with One strain of *Volvariella volvacea* was tested (Table 4.6). The experiment was successful only at two centres i.e. Ludhiana and Coimbatore. At Ludhiana centre paddy straw bundles (each 45cm x 15cm weighing 500g) were soaked for 12-14h in 1.5% CaCO_3 mixed water to a moisture level of 65-67%. The spawn of six *V. bombycina* strain VB-15-06 was prepared on wheat grains. Spawn run was complete in 10 days of spawning and first harvest was made after 13 days to give 14.8 kg mushrooms/qtl dry straw. Fruit bodies were companulate with 3-5cm long stipe and 2-4cm pileus diameter. At Coimbatore centre, the spawn run took 6.8 days and first harvest was after 11.6 days. A very biological efficiency was obtained (15.31 kg/ 100 kg dry straw). At Bhubneshwar, Ranchi, Hisar, Raipur, Samastipur, Jammu and Sikkim centres. However, mycelia colonization could not be observed in any of the beds even 15 days after spawning. Hence, no valid conclusion could be drawn out of the trial under report. Average fruit body weight of 22.4 g was recorded in case of *V. bombycina* as compared to 19.6 g in case of *Volvariella volvacea*. At Coimbatore centre *V. bombycina* fruited much earlier than *V. volvacea*.

4.4 Evaluation of high yielding varieties/strains of Oyster Mushroom (*Pleurotus* spp)

This trial was conducted at 20 different centres. A total of six high yielding strains of *Pleurotus* species were under evaluation trial (Table 4.7). Two trials were conducted for the experiment, one during Aug to Oct when temp ranges between 20-30°C and second during December – January when Temperature is lesser than 20°C. All the strains under testing gave maximum biological efficiency at Coimbatore centre with a maximum BE of 131.27 kg/100 kg of dry straw in PI-15-03. Lowest BE was recorded at Bangalore centre in the strain PI-15-04. The results are presented in Table. 4.7. Overall average showed maximum average BE of 63.94 kg/100 kg straw in PL-15-06 strain.

Table. 4.6. Testing of low temperature requiring paddy straw mushroom, *V. bombycina*

Location	Strains	Spawn run (d)	First harvet (d)	Yieldkg/q dry sub.	Av. Fruit body wt
Ludhiana	VB-15-06	10	13	14.8	8.1
	Vv-15-09	14	17	5.5	6.3
Coimbatore	VB-15-06	6.8	11.6	15.31	22.4
	Vv-15-09	18.2	22.6	2.36	19.6
Bhubaneshwar	VB-15-06	—	13	13.70	11.17
	Vv-15-09	**	**	**	**
Ranchi	VB-15-06	—	—	10.83	9.48
	Vv-15-09	**	**	**	**
Hisar	VB-15-06	—	12.5	12.0	13.3
	Vv-15-09	**	**	**	**
Raipur	VB-15-06	—	25	7.2	—
	Vv-15-09	**	**	**	**
Samastipur	VB-15-06	**	**	**	**
	Vv-15-09	**	**	**	**
Jammu	VB-15-06	**	**	**	**
	Vv-15-09	**	**	**	**
Sikkim	VB-15-06	**	**	**	**
	Vv-15-09	**	**	**	**

** Not successful

**Fig. 4.11.** VB-15-06 crop at Coimbatore**Fig. 4.12.** Vv-15-09 crop at Coimbatore**Fig. 4.13.** VB-15-06 crop at Ludhiana**Fig. 4.14.** Vv-15-09 crop at Ludhiana**Fig. 4.15.** Cross section of VB-15-06 fruit body at Ludhiana centre**Fig. 4.16.** Cross section of Vv-15-09 fruit body at Ludhiana

Table 4.7. Strain evaluation of oyster mushroom species

Location		Strains						
		PI-15-01	PI-15-02	PI-15-03	PI-15-04	PI-15-05	PI-15-06	CD (5%)
Bangalore	Trial-1	20.22	8.92	10.67	0.83	15.93	2.13	6.43
	Trail-2	37.42	25.14	31.08	30.60	27.61	15.54	6.12
Barapani	Trial-1	74.3	-	84.7	85	77.8	92.6	NS
Bhubneswar	Trial-1	43.98	54.91	67.84	0	56.56	73.73	10.0
Coimbatore	Trial-1	101.61	124.55	131.27	106.22	100.27	106.72	6.24
Hisar	Trial-1	52.1	51.7	59.8	43.4	56.9	62.3	12.5
Jammu	Trial-1	28.34	44.90	29.01	18.02	27.12	58.32	2.07
	Trail-2	29.4	41.6	30.2	19.2	27.8	58.6	3.80
Kalyani	Trial-1	106.22	100.26	106.88	101.6	114.26	117.93	—
Manipur	Trial-1	59.65	45.82	81.83	53.60	42.40	83.14	—
Mizoram	Trial-1	14.45	18.02	10.23	12.20	8.98	16.10	—
Palampur	Trial-1	10.3	24.3	18.3	16.5	18.7	23.1	6.1
	Trail-2	19.3	16.5	25.3	16.7	19.1	21.8	6.0
Pantnagar	Trial-1	54.34	66.77	69.20	33.41	66.15	53.17	9.16
	Trail-2	59.31	71.86	42.45	40.82	51.39	45.96	4.37
Pasighat	Trial-1	81.5	—	63.4	76.8	—	—	—
Pune	Trial-1	87.12	100.68	93.48	88.52	90.49	76.35	2.37
	Trail-2	73.93	36.92	—	65.97	45.25	70.52	6.92
Pusa	Trial-1	75.60	74.14	85.70	85.10	83.90	91.00	—
Raipur	Trial-1	75.53	74.05	76.26	73.73	79.62	88.66	NS
	Trail-2	60.61	71.72	67.66	65.05	68.02	—	2.63
Ranchi	Trial-1	67.2	66.95	71.3	67.55	73.15	65.95	3.912
	Trail-2	58.87	60.45	67.13	63.05	70.82	61.45	7.51
Srinagar	Trial -1	46.11	39.9	36.02	44.12	58.1	57.12	3.07
Udaipur	Trial-1	64.83	47.30	53.55	66.33	77.43	80.25	1.29
	Trail-2	65.08	43.03	52.90	67.25	82.70	60.95	1.85
Vellayani	Trial-1	26.40	16.60	72.40	36.10	43.20	56.40	9.20
Jorhat	Trial-1	51.57	62.71	54.69	43.60	60.07	55.08	7.9
Average	Trial-1	54.64	53.72	61.94	50.41	57.45	63.94	—
	Trail-2	50.49	45.90	45.25	46.08	49.09	47.83	—

Trial -1 : Aug-Oct; Trial -2: Dec- Jan

The minimum time taken for the first harvest was recorded as 14.2 days and 14.67 days at Coimbatore and Ranchi centre while maximum first harvest time of more than 40 days was recorded at Bangalore centre in all the strains tested (table 4.8). Maximum fruit body weight of 25.1g was recorded in strain PI-15-03, PI-15-04 at Barapani centre while the lowest Fruit body weight of 2.67g at Barapani centre (Table 4.9).

Table 4.8. Time taken for first harvest in different strains of *Pleurotus*

Location		Strains					
		PI-15-01	PI-15-02	PI-15-03	PI-15-04	PI-15-05	PI-15-06
Bangalore	Trial-1	40	42	42	46	48	34
	Trial-2	21	30	25	26	25	26
Barapani		24	-	23	27	25	26
Bhubneswar	Trial-1	27.57	25.23	26.63	0	26.27	29.53
Coimbatore	Trial-1	14.2	21.2	11.8	18.2	23.4	18.2
Hisar	Trial -1	29.3	21.2	25.4	26.6	27.2	23.5
Jammu	Trial -1	—	—	—	—	—	—
Kalyani		29.1	30	32	35	36	28
Manipur	Trial -1	31.24	36.06	30.06	31.00	37.00	33.21
Mizoram	Trial -1	22.2	19	22.7	20.7	27.5	24.1
Palampur	Trial-1	35	35	35	35	35	35
	Trial-2	24	24	23	—	22	23
Pantnagar	Trial-1	16	16	18	20	16	18
	Trial-2	18	13	20	19	17	22
Pasighat	Trial-1	25	—	21	28	—	—
Pune	Trial-1	24	21	25	26	24	30
	Trial-2	24	31	—	28	25	25
Pusa	Trial-1	28.86	25.79	25.66	23.79	23.66	24.59
Raipur	Trial -1	35	34	38	33	24	31
	Trial-2	35	34	35	34	31	—
Ranchi	Trial -1	14.67	14.67	14.67	14.67	14.67	14.67
	Trial-2	19.67	19.67	19.67	19.67	19.67	19.67
Srinagar	Trial -1	18.19	24.15	25.43	25.52	19.05	18.41
Udaipur	Trial -1	36	35	40	35	34	36
	Trial-2	22	24	26	23	30	27
Vellayani	Trial -1	30	32	38	34	32	34

Trial-1: Aug.-Oct.; Trial-2: Dec.-Jan.

Table 4.9. Average fruit body weight in different strains of *Pleurotus*

Location		Strains					
		PI-15-01	PI-15-02	PI-15-03	PI-15-04	PI-15-05	PI-15-06
Bangalore		—	—	—	—	—	—
Barapani		20.9	-	25.1	21.8	20.9	32.2
Bhubneswar		2.67	3.69	3.22	0	5.15	5.47
Coimbatore		15.63	16.42	14.69	18.01	19.15	18.40
Hisar		—	—	—	—	—	—
Jammu		—	—	—	—	—	—
Kalyani		15.63	16.42	14.69	18.01	19.15	18.4
Manipur		—	—	—	—	—	—
Mizoram		—	—	—	—	—	—
Palampur		7.8	8.8	7.4	6.5	7.7	6.9

Location	Strains					
	PI-15-01	PI-15-02	PI-15-03	PI-15-04	PI-15-05	PI-15-06
Pantnagar	5.20	6.78	4.99	4.69	4.84	4.56
Pasighat	—	—	—	—	—	—
Port Blair						
Pune	4.96	3.26	6.33	4.70	7.92	3.97
Pusa	8.0	7.2	11.0	8.5	10.6	6.9
Raipur	8.0	7.0	13.0	10.5	8.0	7.0
Ranchi	8.65	8.85	9.95	9.13	8.81	8.79
Sikkim						
Srinagar	10.95	9.97	12.33	10.28	10.3	11.6
Udaipur	7.746	7.76	5.934	6.764	7.452	7.566
Vellayani	—	—	—	—	—	—



Fig. 4.17. Oyster mushroom crop at Udaipur centre



Fig. 4.18. Fruitbody quality at Barapani



Fig. 4.19. Oyster crop at Bangalore



Fig. 4.20. PL-15-03 at Coimbatore centre



Fig. 4.21. PL-15-06 at Vellayani centre



Fig. 4.22. Oyster mushroom crop at Bhubaneswar centre



Fig. 4.23. Oyster mushroom crop at Jammu



Fig. 4.24. PL-15-03 at Kalyani centre



Fig. 4.25. PL-15-04 at Manipur centre



Fig. 4.26. PL-15-04 at Mizoram centre



Fig. 4.27. PL-15-03 at Palampur centre



Fig. 4.28. PL-15-03 at Pantnagar centre



Fig. 4.29. PL-15-04 at Pasighat centre



Fig. 4.30. PL-15-03 at Pune centre



Fig. 4.31. PL-15-03 at Raipur centre



Fig. 4.32. PL-15-03 at Ranchi centre

4.5 Advanced varietal trail for high yielding strains of milky mushroom

This trial was allotted to eleven different Centres and five strains of milky mushroom were to be evaluated. But due to non-receipt of the cultures, all the centres could not complete the experiment. At some centres where the culture was received late, the experiment is still ongoing. Till now only three

Table 4.10. Advanced varietal trail for high yielding strains of milky mushroom (kg/100 kg dry sub)

Strain	Udaipur	Hisar	Vellayani	Average
CI-15-01	43.64	43.6	35.0	40.75
CI-15-02	36.72	61.2	72.0	56.64
CI-15-03	29.44	49.7	26.0	35.05
CI-15-04	70.33	52.2	31.0	51.18
CI-15-05	41.67	50.9	45.0	45.86
CD (0.05)	3.26	7.9	4.29	

centres have completed the experiment and reported the results of the experiment (Table 4.10). Amongst the three centres, the maximum yield of 72 kg/ 100 kg straw was obtained at the Vellayani centre in CI-15-02 strain followed by CI-15-04 strain (70.33 kg/100 kg straw) at Udaipur centre. Minimum yield of 29.44 kg/ 100 kg straw was obtained in CI-15-03 strain at Udaipur centres. Overall average showed that CI-15-04 performed the best amongst the strains tested.



Fig. 4.33. Strain evaluation trial of milky mushroom at Vellayani centre



Fig. 4.34. Strain evaluation trial of milky mushroom at Udaipur centre

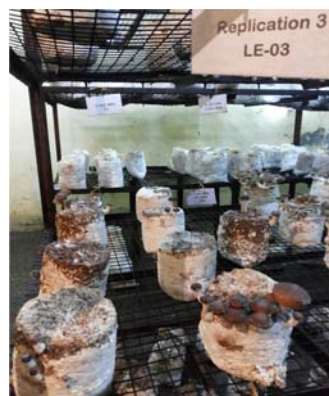
4.6 Initial Varietal trial of *Shiitake* mushroom

This trial was allotted to six different centres and six strains of shiitake mushroom were to be evaluated. The evaluation was to be done on two substrates i.e. saw dust and wheat straw. A total of three centres have reported successful results of the experiment. The maximum biological efficiency of 76.94 kg / 100 kg of dry substrate was obtained at Pantnagar centre on wheat straw based substrate in LE-15-06 strain followed by LE-15-04 strain at the same centre on wheat straw. Highest biological efficiency on saw dust was recorded to be 66.89 kg /100 kg dry saw dust at pantnagar centre in LE-15-06 strain itself. Overall average biological efficiency showed that the strain LE-15-06 performed the best on both the substrates (Table 4.11).

Table 4.11. Initial varietal trail for shiitake mushroom (kg/100 kg dry sub)

Strain	Murthal		Bangalore	Vellayani	Pantnagar		Average	
	Saw dust	Wheat Straw	Saw dust	Saw dust	Saw dust	Wheat straw	Saw dust	Wheat straw
LE-15-01	8.8	7	**	29	25.11	47.41	20.97	27.21
LE-15-02	0	0	**	42	38.39	60.69	26.80	30.35
LE-15-03	24.9	7.1	**	39	16.80	39.10	26.90	23.10
LE-15-04	33.7	1.8	**	22	51.85	71.82	35.85	36.81
LE-15-05	5.9	0	**	53	40.77	63.44	33.22	31.72
LE-15-06	5.2	3.8	**	47	66.89	76.94	39.70	40.37
CD (0.05)	3.26	0.84	—	4.29	7.39	6.32		

** = All the bags were contaminated

**Fig. 4.35.** Shiitake strain evaluation at HAIC Murthal**Fig. 4.36.** Contaminated shiitake bag at Bangalore**Fig. 4.37.** Shiitake strain evaluation at Vellayani centre

4.7 Evaluation of zero energy poly tunnel technology

The trial was assigned to three different centres i.e. Hisar, Murthal and Samastipur. A new method of compost preparation using perforated pipes inside the compost pile was developed at DMR, Solan, which do not cause any air pollution by using passive aeration. Result indicated that ZEPT compost supported the growth of *Agaricus bisporus* (U3), colonized the compost within 15 days and took 22-25 days (post casing) for 1st harvest with 23.9 kg/100 kg compost at Samastipur while 16.9 kg/100kg compost at Hisar. The ZEPT method was more suitable under Bihar condition for small farmers (Up to 100 Q straw). As regards Benefit cost ratio, the labour requirement is just ½ of the long method of composting with higher yield. Overall average yield showed 15.60 kg /100 kg compost in Zero energy poltunnel technology (Table 4.12).

Table 4.12. Evaluation of zero energy poly tunnel technology (kg/q)

Strain	Hisar			Murthal			Samastipur			Average		
	BE (%)	1 st Harvest (days)**	Av. FB wt. (g)	BE (%)	1 st Harvest (days)	Av. FB wt. (g)	BE (%)	1 st Harvest (days)	Av. FB wt. (g)	BE (%)	1 st Harvest (days)	Av. FB wt. (g)
ZEPT	16.9	23.5	11.7	5.99	—	15.3	23.9	25	—	15.60	24.25	13.5
Long method composting	16.2	22.5	12.9	—	—	—	—	—	—	16.2	22.5	12.9
Short method composting	—	—	—	—	—	—	18.75	25	—	18.75	25	—

** = post casing

**Fig. 4.38.** ZEPT technology in use at Murthal Centre

4.8 Evaluation of different bacterial isolates and effect of pre spawning of casing soil prior to pasteurization on survival / inoculums of *Mycogone perniciosa*

No one has performed this experiment due to spread of the disease in their farm.

4.9 Reporting of unique mushroom recipes of your area

Bhubaneshwar

Chhatu patrapoda

Ingredients

Mushroom : 400g
 Potato (large) chopped : 1

Banana leaves	:	4
Finely chopped onion	:	1
Green chilli	:	4
Turmeric powder	:	½ tsp
Red chilli powder	:	½ tsp
White mustard seed	:	2tsp
Cumin seed	:	½ tsp
Garlic cloves	:	6 nos.
Red chilli	:	2-3 nos.
Tamarind paste	:	1 tsp
Mustard oil	:	1 tsp
Threads to tie up the leaves		
Salt to taste		

Procedure:

Clean and wash the mushroom, squeeze the water from it. Heat ½ tsp oil in a kadhai and fry the mushroom in high flame. Sprinkle little salt to it. When mushroom became half boiled, transfer it to a plate. In a bowl, take all the ingredients: mushroom, potato, onion, green chilli, mustard oil, tamarind, turmeric, chilli powder and mustard paste. Mix all the ingredients and keep aside for about 10 minutes. Add salt to taste. Spread little oil on the leaf and wrap it from all sides and tie up with a thread tightly. Heat 1 tsp oil in a kadhai covering it with a lid. Keep the fire slow for 25-30minutes and at 15 minutes interval turn the leaf other side and again cook it for about 10 minutes. Put off the flame and serve hot with steamed rice.

Chhatu besar

Ingredients

Mushroom (clean with water, squeeze and drain out water)	:	500g
Potato (large) chopped	:	1
Onion (sliced)	:	1
Tomato (medium size)	:	1
Dried mango slice (ambula)	:	1
Red chilli powder	:	½ tsp
Mustard seed	:	2tsp
Turmeric powder	:	½ tsp
Mustard oil	:	2 tsp
Salt to taste		

Procedure:

Heat oil in a pan, add mushroom, salt, turmeric powder and stir for 3-5 minutes till turns to brownish. Heat oil in a pan. Add mustard seeds and once it sputters, add small pieces of onion and fry for 2-3 minutes till turn brownish. Add red chilli and turmeric powder and tomato, stir for one minute, add mustard paste, stir for 30 seconds and add $\frac{1}{2}$ cup water. Let the curry cooks in medium flame, stop boiling, add mushroom and ambula and mix well. Cover the lid. When $\frac{1}{2}$ water evaporates from gravy, turn off the gas. Garnish the chopped coriander leaves and serve hot with rice / roti.

Jammu

During the survey programme, the wild edible mushrooms viz., *Rusulla* spp., *Helvella* spp., *Flamullina* spp., collected from the different sites were cooked by the locals in their households and the recipes have been documented along with photographs.

The recipe of *Russula* spp. is as follows:

- Peel off the upper layer from the cap.
- Wash with water and cut mushrooms into small pieces.
- Dip the cut pieces in hot water.
- Take out the mushrooms after 30 seconds from the hot water and cool.
- Heat oil in a pan.
- Add chopped garlic, tomato and green chilli in the hot oil.
- Stir fry till brown.
- Add cooled mushrooms to the cooked paste and cook at low flame.
- Serve with chapattis.

Kalyani

Traditional mushroom (chew) recipe practiced in a tribal village of Darjeeling district

300-350g of fresh mushroom is to be cleaned in a running tap water and peeled unto the preferred size (longitudinally from the fruit body till the base of the stipe) and kept in a strainer letting the water flow out of the strainer-outlets. After the water is drained out, the mushroom should be marinated with 5-6 pieces of crushed garlic, 20-25g of ginger paste, green-chilli (*dalley khorsani*) paste, cumin paste (traditionally crushed in stone or in a wood), 1 teaspoon of turmeric powder, 1 peeled onion and salt as per needed alongwith 200-300 ml of water. The marinated mushroom is then stuffed inside the bamboo internode having one end closed and the other end open. The open end is fitted with an appropriate size of a wooden cork or by a cloth-lid. The loaded bamboo is then inserted under the ash beneath the burning oven (*chullah*) keeping in mind that the bamboo should not be exposed thereby avoiding it from getting burnt. It should be left for at least 15-20 minutes. It should be checked in an interval of 5 minutes for at least 3-4 times by opening the cork. If the upper layer of water is dried and is giving delicious aroma, it is ready to be served. This dish is specially practiced by marginal tribal families in a small village named **Todey** in the Darjeeling district. The practice nearly came to an end in the recent years because of the roaring uprise of globalization but is still treasured and followed by the elders which remains unknown to many. The elders specially follow the recipe while in jungle poaching, ranching cattle or curing large cardamom (*Amomum subulatum* Roxb.)

Ludhiana

Matar Mushroom Recipe

Ingredients:

Green peas	-	1 1/2 cups
Mushrooms	-	200 grams
Onions, finely chopped	-	2 large
Ginger paste	-	1 tablespoon
Garlic paste	-	1 tablespoon
Tomato puree	-	1/2 cup
Green cardamoms	-	4
Cinnamon	-	1 inch stick
Red chilli powder	-	1 tablespoon
Coriander powder	-	1 tablespoon
Turmeric powder	-	1 teaspoon
Garam masala powder	-	1 teaspoon
Salt as required		
Oil	-	2 tablespoons

Method: Heat oil in a kadai. Add cinnamon stick, green cardamom and onions and fry till it gains light golden brown. Then add ginger and garlic paste and fry for one minute. This is followed by addition of tomato puree and combination of various masala such as red chilli powder, coriander powder, turmeric powder, garam masala powder and salt. Heat this mixture till oil leaves the masala. Add a cup of water, bring the mixture to a boil and then add green peas and mushrooms. Cook on high flame till the green peas are fully cooked. The dish is ready to be served hot.

Mushroom Pulao Recipe

Ingredients:

Basmati rice	:	1½ cup (soaked for 20 to 30 mins before cooking)
Button/ Dhingri mushrooms	:	200-250 gms
Onion	:	1 large (thinly sliced or finely chopped)
Tomato	:	5! cup chopped tomatoes
Potato	:	1 medium size(peeled & cubed)
Green chilies	:	1 - 2 (chopped)
Garlic and Ginger paste	:	½ tbsp each
1 cup thick milk	:	200 ml
Salt as required		
Oil	:	2 tablespoon

cumin/jeera	:	1 tablespoon
Green cardamoms	:	3
Cloves	:	4
Black peppers	:	a pinch
Cinnamon	:	1 to 1.5 inches

Method: Clean, wash and soak the rice for 20 to 30 minutes. Chop all the vegetables including mushrooms. Add oil to pressure cooker and heat. Add cumin seeds, and fry till they begin to crackle. Then add the onions and fry them till golden brown in color followed by addition of the ginger-garlic paste and saute till the raw smell of the paste disappears. Now add the chopped tomatoes, potatoes and mushrooms. Saute for 10 minutes till the mushrooms are half cooked. Now add the soaked rice and the chopped green chili. Cook the rice for 1-2 minutes stirring in between on a low flame. Add the milk and water. Stir and add salt. Pressure cook the rice for 2 to 3 whistles. Garnish with coriander leaves or mint leaves and serve mushroom pulao with curd.

Mushroom Soup

Ingredients:

Button mushrooms	:	200/250 gms
Onion	:	1 large (thinly sliced or finely chopped)
Garlic cloves	:	2-3 (finely chopped)
Bay leaf/tejpatta	:	1
Nutmeg powder	:	one pinch
Water	:	1 cup
Milk	:	1 cup (full fat at room temperature)
Cream	:	6 table spoon
Whole wheat flour/maida	:	1 table spoon
Butter	:	2 table spoon
Chopped parsley/ coriander leaves	:	½ tsp
Black pepper as required		
Salt as required		

Method: Melt butter in a sauce pan. Add the bay leaf and saute till fragrant followed by chopped onions and garlic, heat till they soften and become translucent. Now add the sliced or chopped mushrooms and saute till they release water and attains light brown color. Now add the flour and saute for 3-4 minutes with continuous stirring. Add freshly crushed black pepper and saute for half a minute. To the above mixture add water first followed by milk, stir well and season with salt on a low flame and let the soup come to gentle simmer. When the soup begins to thicken, simmer for about 4-5 minutes. After that add the cream and chopped parsley and simmer for 2-3 minutes. Lastly sprinkle nutmeg powder and stir. Serve the mushroom soup steaming hot garnished with parsley or coriander.

Mushroom Pakora

Ingredients

Besan/Gram flour	:	3 table spoon
Mushrooms (button/dhingri)	:	200 gm
Corn flour	:	½ table spoon
Ginger	:	½ inch
Garlic	:	6 cloves
Green chilli	:	6 no.
Salt as required		
Oil	:	to deep fry

Method: Firstly grind ginger, garlic and green chilly to a fine paste using water. Cut mushroom into 4 or 6 pieces depending on size. Mix the grinded paste, besan, salt, corn flour, salt using water to make a thick batter. Dip each mushroom and deep fry. Serve hot with coriander chutni.

Mushroom Omelet

Ingredients:

Eggs	:	2 no.
Button Mushroom	:	2 tablespoon(chopped)
Onion	:	6 (small sized, chopped)
White Pepper Powder	:	1/2 tsp
Butter	:	2 tblsp
Mustard Powder	:	a pinch
Salt as required		

Method: Beat the eggs thoroughly along with the salt, pepper powder, mustard powder and the chopped small onions. Heat a little of the butter in a pan and add the washed and sliced button mushrooms. Toss in the butter for 2 minutes. Remove the mushrooms and keep aside. Melt the remaining butter in a non stick pan over a medium flame and add the beaten eggs to it. Spread evenly around the pan and sprinkle the mushrooms on top. When one side is cooked slowly fold the omelette into half with a wooden spoon. Remove from the flame and serve hot.

Mushroom curry

Ingredients:

White button mushrooms	:	200/250 gm
Fresh curd/yogurt/dahi	:	4 tablespoon
Onion pate	:	1 tablespoon
Ginger and garlic paste	:	½ teaspoon each
Tomato puree	:	½ cup

Cumin seeds	:	½ tsp
Tejpatta	:	2 small
Cinnamon/dal chini	:	½ inch
Black cardamom/badi elaichi	:	1
Cardamoms/choti elaichi	:	2 green
Cloves	:	3
Turmeric powder/haldi	:	¼ tsp
Red chilli powder/lal mirch powder	:	½ tsp
Coriander powder/dhania powder	:	1 tsp
Garam masala powder	:	¼ tsp
Kasuri methi/dry fenugreek leaves	:	½ tsp (crushed)
Chopped coriander leaves/dhania patta	:	2 tbsp
Water add as required		
Salt as required		
Oil	:	3 tbsp

Method: Rinse and slice/ chop mushrooms. Keep aside. Make a fine paste of onion, ginger and garlic together without adding water. Similarly make a smooth puree of tomatoes. Heat oil in a pan and add the following whole spices -cumin seeds, tejpatta, cinnamon, black cardamom, green cardamoms and cloves. Saute the spices till they become aromatic. Now add the ground onion-ginger-garlic paste till it attains light brown color. Now add the tomato puree. Stir and then add the other spices: turmeric powder, red chilli powder and coriander powder. Then add the sliced or chopped white button mushrooms followed by addition of beaten curd and stir constantly. Simmer the curry on a low to medium flame for 2 to 3 minutes. Now add water as required. Season with salt. Now cover the pan and simmer the gravy till mushrooms are completely cooked. Lastly add kasuri methi (crushed), garam masala powder and chopped coriander leaves. Stir and serve this punjabi mushroom curry with rotis, parathas, naan.

Mushroom pickle preparation

Ingredients:

Button mushroom, boiled	:	2cup
Ginger, garlic paste	:	1tablespoon
Onions, sliced	:	1cup
Turmeric powder	:	1teaspoon
Red chilli powder	:	1tablespoon
Cumin seeds	:	1teaspoon
Garam masala	:	1teaspoon
Mustard seeds[coarsely ground]	:	1tablespoon
Asafoetida	:	a pinch
Vinegar	:	½ cup

Mustard oil	:	¾ cup
Salt	:	1tbs

Method: Cut the mushroom in thick slices and keep aside. Heat half of the oil in a pan, crackle the cumin seeds and heeng, sauté onions till brown. Add ginger, garlic paste, turmeric powder, and mushrooms, salt and continue cooking for 4-5 minutes. Stir in vinegar and cook it for another 3-4 minutes. Remove from the fire, cool it to room temperature and mix in red chilli powder, garam masala and mustard seeds. Put in a sterilized glass bottle, pour the remaining oil over it and shake well. Keep the achar at room temperature for 24 hours. Now the achar is ready to serve and can be stored for 6 months.

Manipur

During the current year three unique mushroom recipes being prepared by the tribal people of Manipur were recorded. Details are given as below:

Mushroom chutney

List of ingredients

Mushroom	:	250 g
King chilli	:	2nos
Fermented fish	:	1 small pc
Garlic	:	3 flakes
Salt	:	to taste

Cooking methodology

1. Wash and boil in a little quantity of water by adding salt till it is cooked well.
2. Cut into desired size.
3. Roast the kingchilli and the fermented fish (locally known as ngari in Manipur) and crush in a pestle with salt and garlic.
4. Then add the mushroom pieces and mix well.
5. Garnish with coriander leaves and serve with rice.

Mushroom Borah/Fritters

List of ingredients

Mushroom	:	250 g
Besan powder	:	100 g
Baking powder	:	¼ tsp
Warm water	:	to make medium batter
Chilli powder	:	1 tsp
Turmeric powder	:	½ tsp
Garam masala	:	1 tsp

Refined oil : for deep fry
Salt : to taste

Cooking methodology

- Wash in running water but do not soak.
- Drain and shred into desired pieces and keep aside.
- Make a thick batter with all the above mentioned ingredients and keep for 15 minutes.
- Meanwhile heat the oil.
- Take each piece, dip in the batter (do not soak) and deep fry each piece into golden brown.
- Serve with sauce or chutney.

Mushroom curry with rajmah

List of ingredients

Ingredient	Quantity	Ingredient	Quantity
Mushroom	500 gm.	Rajmah	250 gm.
Tomato	2 medium	Onion	1 large
Green chili	5	Ginger	1 tsp.
Garlic	5-7 flakes	Turmeric powder	1 tsp.
Garam masala	1 tsp.	Salt	To taste
Oil	4 tbsp.	Coriander leaves	A few

Cooking methodology

- Soak Rajmah overnight after washing.
- Wash and cut the mushroom into desired sizes.
- Cook Rajmah with salt and leave aside
- Heat oil; fry chopped onion, ground ginger and garlic and turmeric powder
- Add chopped tomato, mushrooms and fry till the water dries up
- Add the cooked Rajmah; simmer for few minutes. Add Garam masala
- Mushroom curry with rajmah is ready

Nagaland

A delicacy for the local people of Longleng district

Ingredients

1. Mushroom
2. Chilli
3. Spring onion or bamboo shoot (optional)

4. Banana leaf
5. Ginger
6. Salt

Procedure

1. Sort and wash the mushroom
2. Cut the chilli into 2 equal parts
3. Mix all the ingredients ie., mushroom, chilli, spring onion and salt
4. Wrap it in the banana leaf
5. Bake it under hot ash and keep the fire burning
6. Take it out from the fireplace and have it with rice

NB: The above recipe/information is collected from Yongphang village, Sakshi block, Longleng district on 15th January 2016 by E. Lireni Kikon, KVK Longleng.

Mushroom chutney

The wild mushroom chutney was prepared by tribes of Longleng traditionally.

Sl. No.	Ingredients	Quantity (Aprox)
1	Wild mushroom	4-5 cups
2	Bamboo culm/Banana leaves	30 cm length
3	Warm water	1 cup
4	Salt	2 teaspoon
5	Green chillies	8-10 pieces
6	Smoked pork fat	200 gm
7	Spring Onion	5-7 pieces
8	Smoked or Sun dried bamboo shoot	Half cup

Pune

Oyster Mushroom egg dips

Ingredients

Fresh oyster Mushrooms	-	250 gm
Eggs	-	04 No.
Onion	-	1 (chopped)
Salt and black papper	-	to taste
Red chilly Powder	-	½ tsp
Coriander powder	-	½ tsp
Edible Oil	-	4-6 tsp

Cooking Methodology

- Break eggs into a bowl.
- Add one chopped onion, ½ tsp red chilli, ½ tsp coriander powder along with salt and black papper to taste.
- Beat the mixture with spoon until egg yolk and white are mixed together.
- Simultaneously take fresh properly cleaned oyster mushroom fruits and squeeze properly so that most of the water comes out.
- Thoroughly dip the whole oyster mushroom fruits in above mixture of egg and spices one by one.
- Heat 1 tsp of edible oil in frying pan.
- Put egg dipped (6-7) oyster mushrooms on heated oil in frying pan one by one.
- Change the position of dipped mushroom fruits on frying pan to get properly fried on both sides.
- Remove the cooked egg dip mushrooms from pan and repeat the same procedure for remaining fruits.
- Serve hot with garlic and pudina chutney.

Mushroom Zoonka (Besan)

Ingredients:

Fresh oyster/button Mushrooms	-	200 gm
Gram flour (Besan)	-	250 gm
Onion	-	2 (chopped)
Garlic	-	5-6 cloves (scrapped and cut in to small pieces)
Salt	-	to taste
Red chilly Powder	-	1 tsp
Turmeric	-	½ tsp
Mustard seed	-	½ tsp
Cumin seeds	-	½ tsp
Green chillies	-	3 (cut in to small pieces)
Coriander Leaves	-	dressed and chopped
Edible Oil	-	4-6 tsp

Cooking Methodology

- Take gram flour in big size bowl
- Add water in gram flour and add 1 tsp of red chilli with pinch of salt in it.
- Beat well and make the paste of flowing consistency.
- Cut fresh and cleaned mushrooms in medium size pieces and mix with gram flour of flowing consistency
- Heat cooking oil in kadai put onion and garlic

- Fry the content for two minutes
- Add green chilli pieces, mustard seeds, cumin and turmeric one by one and gently fry the content on low flame
- Add the bowl content (mushrooms with gram flour) in kadai and mix well
- Cook the content on low flame till the bubbles comes out (Aprox. 5-7 min)
- Add fresh coriander leaves on cooked zoonka
- Serve hot with *jawar or bajara Roti*

Oyster Mushroom Shira (Halva)

Ingredients

Fresh oyster Mushrooms	-	200 gm
Rava (semolina)	-	200 gm
Sugar	-	250 gm
Cardamom powder	-	1 tsp
Ghee	-	4-6 tsp
Almond	-	15 gm
Cashew nut	-	15 gm

Cooking Methodology

- Take 4 tsp ghee in kadai or hard pan and heat slightly
- Add rava (suji/ semolina) and roast on slow flame till appears slight brown
- Remove the fried rava from pan/kadai in plate
- Take sufficient water (Apx. 500-700 ml) in Kadai add 200 gm sugar, 1 tsp cardemon powder and 200 gm fresh medium chopped mushrooms.
- Boil the content for five minutes
- Add already roasted Rava/suzi in above boiling content
- Cook the content till bubbles comes out and become semisolid to solid
- Garnish with almond and cashew nut
- Serve in hot condition

Sikkim

Mushroom cooked with Phing (This is a unique dish in which local wood ear mushroom is used)

Ingredients

Wood ear mushroom	-	200g
Phing(Translucent noodles)	-	100g
Tomato	-	1 finely chopped

Onion	-	1 finely chopped
Chilli	-	chopped as per taste
Turmeric powder	-	half tea spoon
Coriander leaf	-	chopped for garnishing
Garlic	-	8 cloves, grinded
Salt to taste		
Oil	-	1/4 cup

Methodology

- Soak the mushroom in a warm water for 15 min, drain and squeeze.
- In a separate bowl soak phing in warm water and drain and cut into pieces.
- Heat the pan and put ¼ cup of oil.
- Add chopped onion and garlic paste.
- Cook until soft.
- Add mushroom and turmeric powder wait until properly cooked.
- Add tomato and chilli.
- Stir and add salt to taste.
- Let it cook for a while.
- Add phing and stir, let it get mixed well with mushroom.
- Cook for another 5 mins.
- Garnish with chooped coriander.

Udaipur

The desert area of Rajasthan has a rare distinction of producing a wild variety of Mushroom, in the sands miles together.

A simple recipe of Podaxis pistillaris Mushroom

Ingredients (100 g of Mushroom)

Onion one big size finely cut

Small quantity of peas (Mater) optional

¾ cloves of garlic finely cut

One tomato finely cut.

Red Chili powder	—	1tea spoon.
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Turmeric powder	—	1/4 tea spoon.
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Coriander powder	—	2 tea spoon.
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Garam masala and salt as per taste.



Chatu besar, Odisha



Cooked Russula, Jammu



Mixed Mushroom, Jammu



Traditional mushroom (chew) recipe of Darjeeling district



Mushroom Dishes of Punjab and Himachal Pradesh



Mushroom Dishes of Punjab and Himachal Pradesh



Mushroom Chutney from Manipur



Mushroom Borah from Manipur



Mushroom delicacy from Nagaland



Oyster Mushroom Egg dips from Maharashtra



Oyster Mushroom Shira/Halva from Maharashtra



Mushroom Zoonka from Maharashtra



Mushroom dish from Chattishgarh



Recipes of *Phellorinia inquinans*



Recipes of *Podaxis pistillaris*



Shiitake biscuit from Vellayani



Payasam (Milky mushroom) from Vellayani



Theeyal (Oyster mushroom) from Vellayani centre

Fig. 4.39. Mushroom based recipes from different parts of India

Cooking methodology

- Wash the Mushroom thoroughly under flowing tap so as to wash away all dirt etc.
- Cut the Mushroom in small pieces.
- Fry the onion till it becomes golden brown.
- Add the cut Mushroom and stir well
- Add garlic, tomato, ginger paste and fry well
- Add water 100 cc and cook.
- As the Mushrooms are fiberious, cook this in pressure cooker – 2 whistles. Now the tasty vegetable is ready to be served.

A simple recipe of (Phellorinia pistillaris) Mushroom

Ingredients (100 g of Mushroom)

Onion one big size finely cut.

Small quantity of peas (Mater) optional

$\frac{3}{4}$ cloves of garlic finely cut

One tomato finely cut.

Red Chili powder – 1tea spoon.

Turmeric powder – $\frac{1}{4}$ tea spoon.

Coriander powder – 2 tea spoon.

Garam masala and salt as per taste.

Cooking methodology

- Wash the Mushroom thoroughly under flowing tap so as to wash away all dirt etc.
- Cut the Mushroom in small pieces.
- Fry the onion till it becomes golden brown.
- Add the cut Mushroom and stir well
- Add garlic, tomato, ginger paste and fry well
- Add water 100 cc and cook.
- As the Mushrooms are fiberious, cook this in pressure cooker – 2 whistles. Now the tasty vegetable is ready to be served.

5. COLLECTION, IDENTIFICATION AND CONSERVATION OF WILD EDIBLE GERMPLASM FROM LOCAL MARKET

Different Centres have reported the collection of specimens of wild mushrooms during the year and about 365 collections have been made and a total of 121 specimens were deposited at the DMR Gene Bank with passport data. During the last workshop of AICRPM, it has been decided that different mushrooms collected and consumed locally by the people of different regions will be collected and we should take advantage of the ITK available on mushrooms and utilize this germplasm instead of going for random collection of wild germplasm. In this regard it was decided that the Centres will survey the local markets for collecting the germplasm in addition to forest forays, collect the data, make cultures and deposit these with DMR along with their photographs, dried samples and passport data. The outcome has been summarized in table 5.1.

Table 5.1. Germplasm and passport data collected and supplied to DMR, Solan by AICRP Centres

Centres	No. of mushroom species collected	No. of specimens deposited	Accession No obtained
PAU, Ludhiana	6	6	6
TNAU, Coimbatore	0	0	0
MPKV, Pune	71	20	13
GBPUA&T, Pantnagar	51	11	11
IGKV, Raipur	19	15	15
MPUAT, Udaipur	34	34	14
KAU, Kerala	54	18	8
HAU, Hisar	0	0	0
OUAT, Bhubneshwar	28	12	12
RAU, Samastipur	5	0	0
CAU Pasighat	21	0	0
HAIC, Murthal	3	0	0
HPKV, Palampur	0	0	0
ICAR RC for NEH Region, Barapani	0	0	0
ICAR RC, Sikkim	5	4	3
ICAR RC, Arunachal Pradesh	0	0	0
ICAR RC, Nagaland	9	0	0
ICAR RC, Mizoram	8	0	0
ICAR RC, Tripura	0	0	0
ICAR RC, Manipur	38	6	4
ICAR-CARI, Port Blair	0	0	0
IIHR, Bangalore	0	0	0
UHF, Nauni	0	0	0
VPKAS, Almora	1	0	0
SKUAST, Kashmir	0	0	0
SKUAST, Jammu	6	0	0
AU Assam	0	0	0
SVBP, Meerut	0	0	0
BCKVV, Kalyani	8	0	0
DAU, Gujrat	0	0	0
ANGRAU Hyderabad	0	0	0
ICAR-DMR, Solan	205	79	79
Total	576	206	165

Solan Centre

Fungal forays were undertaken in the forest areas of Himachal Pradesh and Tripura. A total number of 205 specimens were collected from Himachal Pradesh and 193 specimens identified up to genus level (Figs. 5.1 & 5.2). Further, pure tissue cultures of 79 specimens were obtained and deposited in the Gene Bank of DMR, Solan. Some of the interesting specimens include *Strobilurus* sp., *Pleurotus* sp., *Phylloporus* sp., *Chrogomphus*, *Cortinarius* sp., *Amanita* sp., *Armillaria melleae*, *Lepiota* and *Lepista* sp. which were fully described for identification. Similarly, 24 wild mushroom specimens were collected during rainy season from the forests of Khovaicorin, Kola Khor, Sumaimori and Boxanagar of Tripura. All the specimens were examined for their macroscopic characters and tissue cultures were isolated and conserved in the Gene Bank of ICAR-DMR, Solan and Department of Botany, Tripura University. The interesting and important genera includes- *Agaricus* (three spp.), *Clitocybe sinopica* (a new record from India), *Stropharia stercorea*, *Lactarius tabidus*, *Agrocybe splendida*, *Calocera* sp., *Amanita* sp. (vaginatae group), *Lentinus squarrosulus*, (three specimens), *Auricularia* (three Specimens), *Inocybe* (2 – unique specimens), *Entoloma* (one specimen), *Lentinus* (one specimen) and a *Marasmius* sp.

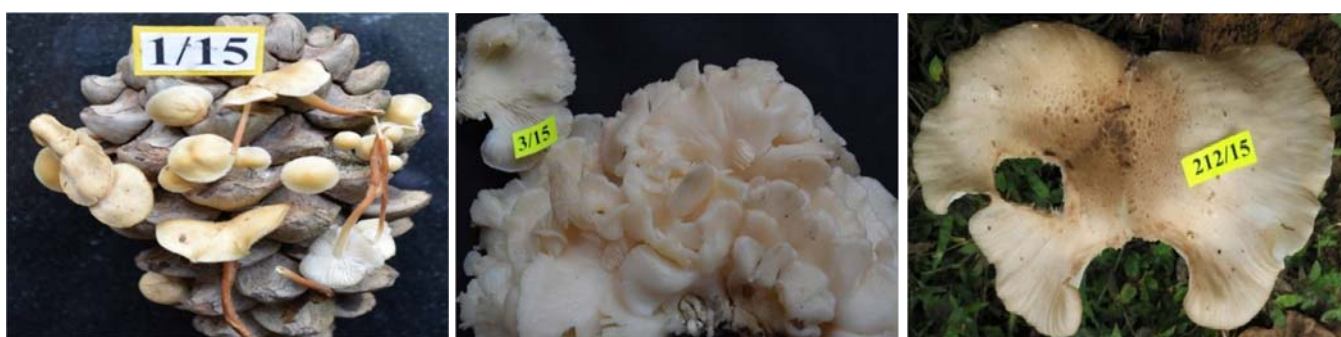


Fig. 5.1. Wild specimens of *Strobilurus*, *Pleurotus djamor* var. *djamor* and *Clitocybe sinoptica*



Fig. 5.2 Wild specimens of *Pisolithus tinctorus*, *Armillaria melleae* and *Auricularia* sp.

Ludhiana Centre

Wild mushroom flora was surveyed in the districts of Punjab during the months from July to September, 2015. Six mushrooms were collected and accessioned as DMRO-729 to DMRO-734. Mushrooms were identified as *Pleurotus* sp. (DMRO 729), *Agaricus* sp. (DMRO 730), *Boletus* sp. (DMRO 732) and *Ganoderma* sp. (DMRO 734) as in Fig. 5.3.



Fig. 5.3. Wild collections by PAU Ludhiana

Bhubaneswar Centre

Surveys were conducted in six districts under four agro-climatic situations of the state during Kharif, 2015. Twenty eight indigenous mushrooms have been collected and identified based on available information. However, cultures of 12 mushrooms have been deposited at the Directorate of Mushroom Research, Solan. They were *Calocybe indica*, *Ganoderma lucidum*, *Lentinus* sp, *Termitomyces eurrhizus*, *T. clypeatus* and *Volvariella volvacea* (Table 5.2) .

Table. 5.2. Wild mushroom germplasm collected at Bhubaneswar centre (2015-16) (Cultures deposited at ICAR- Directorate of Mushroom Research, Solan)

Sl. No.	Scientific Name	Local Name	Habitat/ Substrate	Locality	Date of collection	Edibility
1	<i>Ganoderma lucidum</i>	Reishi chhatu	Wooden stumps	Bhubaneswar, Khurda	14.07.2015	Medicinal
2	<i>Termitomyces clypeatus</i>	Badabali Chhatu	Deciduous grass land	Bhubaneswar, Khurda	16.07.2015	Edible
3	<i>Calocybe indica</i>	Dudha chhatu	Soil	Gadamanatir, Khurda	14.07.2015	Edible
4	<i>Calocybe indica</i>	Dudha chhatu	Soil	Bhubaneswar, Khurda	30.07.2015	Edible
5	<i>Volvariella volvacea</i>	Pala chhatu	Decay straw heap, grass land	Nuapara	21.08.2015	Edible
6	<i>Termitomyces eurrhizus</i>	Nada chhatu	Deciduous grass land	Nuapara	22.08.2015	Edible

Sl. No.	Scientific Name	Local Name	Habitat/ Substrate	Locality	Date of collection	Edibility
7	<i>Lentinus sp.</i>	Khunta chhatu	Decaying wood	Narayani hill, Ganjam	16.08.2015	Unknown
8	<i>Volvariella volvacea</i>	Pala chhatu	Decay straw heap, grass land	Govindapur, Keonjhar	13.08.2015	Edible
9	<i>Volvariella volvacea</i>	Pala chhatu	Decay straw heap, grass land	Kusapada, Keonjhar	14.08.2015	Edible
10	<i>Volvariella volvacea</i>	Pala chhatu	Decay straw heap, grass land	Kusapada, Keonjhar	14.08.2015	Edible
11	<i>Volvariella volvacea</i>	Pala chhatu	Decay straw heap, grass land	Kusapada, Keonjhar	14.08.2015	Edible
12	<i>Volvariella volvacea</i>	Pala chhatu	Decay straw heap, grass land	Kusapada, Keonjhar	14.08.2015	Edible

Other species (16) collected during the same period were *Amanita sp.*, *Lepiota sp.*, *Lentinus sp.*, *Leucocoprinus sp.*, *Macrolapiota procera*, *Mutinus sp.*, *Russula rosea*, *R. virescense*, *Termitomyces clypeatus*, *T. eurrhizus*, *T. macrocarpus*. Photographs from the natural habitats have been taken and mushrooms conserved (Table 5.3).

Table 5.3. Wild mushroom germplasm collected at bhubaneswar centre (2015-16) (Cultures have not been deposited)

Sl. No.	Scientific Name	Local Name	Habitat/ Substrate	Locality	Date of collection	Edibility
1	<i>Macrolepiota procera</i>	-	Pastures	Bhubaneswar, Khurda	24.06.2015	Not known
2	<i>Lepiota sp.</i>	-	Pastures	Bhubaneswar, Khurda	22.07.2015	Not known
3	<i>Mutinus sp.</i>	-	Pastures	Bhubaneswar, Khurda	25.07.2015	Not known
4	<i>Lentinus sp.</i>	Khunta Chhatu	Decaying wood	Narayani hill, Ganjam	16.08.2015	Unknown
5	<i>Termitomyces eurrhizus</i>	Nada chhatu	Deciduous grass land	Govindapur, Keonjhar	13.08.2015	Edible
6	<i>Amanita sp.</i>	Dhala manda	Deciduous grass land	Govindapur, Keonjhar	13.08.2015	Edible
7	<i>Russula rosea</i>	Nali Kukuda Chhatu	Deciduous grass land	Govindapur, Keonjhar	13.08.2015	Edible
8	<i>Russula virescense</i>	Jamu chhatu	Deciduous grass land	Govindapur, Keonjhar	13.08.2015	Edible
9	<i>Termitomyces sp</i>	Badabali chhatu	Deciduous grass land	Govindapur, Keonjhar	13.08.2015	Edible

Sl. No.	Scientific Name	Local Name	Habitat/ Substrate	Locality	Date of collection	Edibility
10	<i>Termitomyces clypeatus</i>	Batik chhatu	Deciduous grass land	Kusapada, Keonjhar	14.08.2015	Edible
11	<i>Termitomyces eurrhizus</i>	Nada chhatu	Deciduous grass land	Kusapada, Keonjhar	14.08.2015	Edible
12	<i>Lentinus sp</i>	Khunta chhatu	Dead woods	Narayani hill, Ganjam	16.08.2015	Unknown
13	<i>Termitomyces clypeatus</i>	Batik chhatu	Deciduous grass land	Baratunda, Bargarh	21.08.2015	Edible
14	<i>Leucocoprinus sp.</i>	Gobar chhatu	Deciduous grass land	Bharuamunda, Nuapara	22.08.2015	Unknown
15	<i>Termitomyces microcarpus</i>	Hunka chhatu	Termite soil	Bhubaneswar, Khurda	3.09.2015	Edible
16	<i>Phallus sp.</i>	-	Deciduous grass land	Bhubaneswar, Khurda	29.08.2015	Unknown

*Ganoderma lucidum**Termitomyces clypeatus**Calocybe indica**Calocybe indica**Lentinus sp.**Volvariella volvacea**Volvariella volvacea**Volvariella volvacea**Volvariella volvacea*

Fig. 5.4. Wild fleshy fungi (Cultures submitted to DMR, Solan) by Bhubaneswar centre

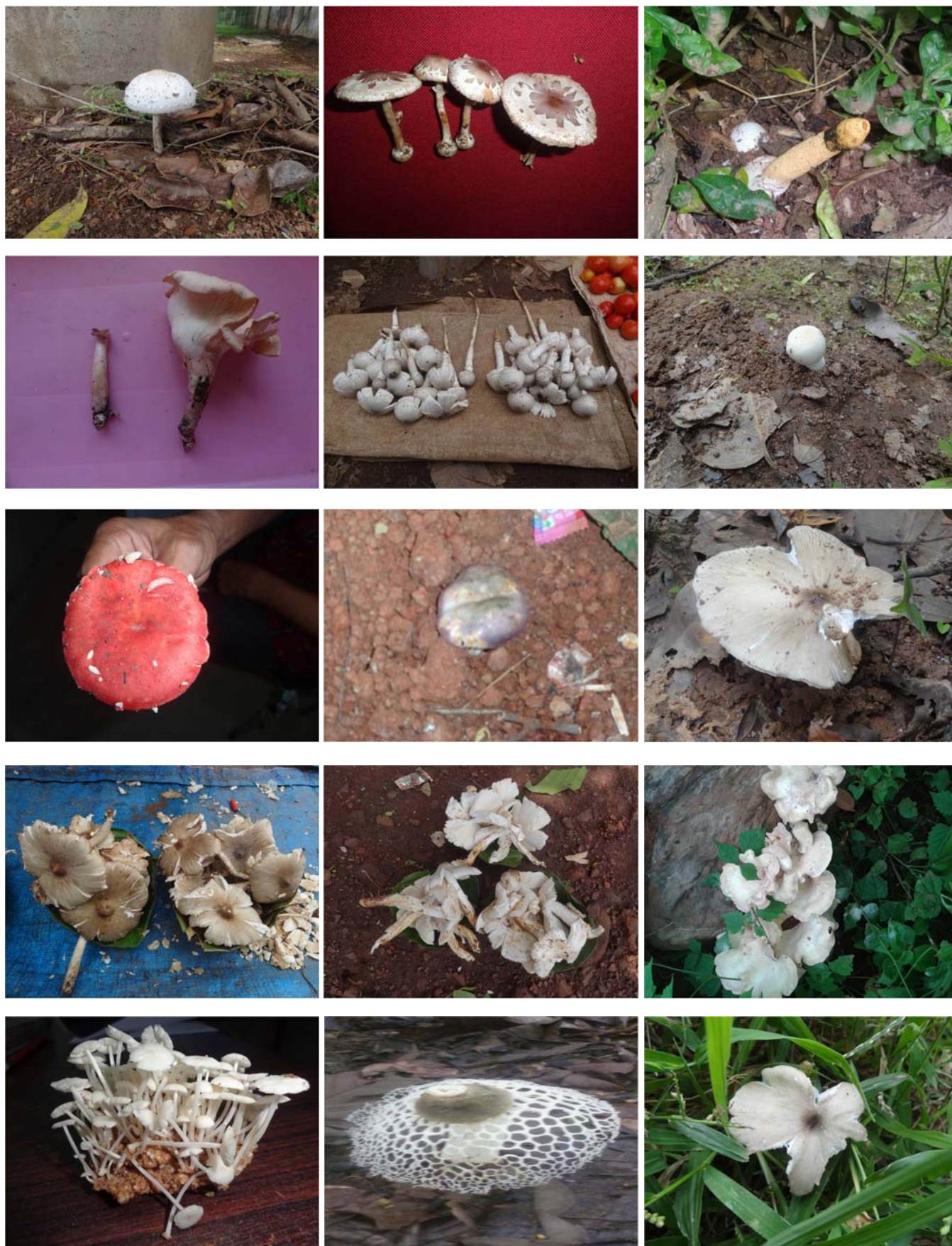


Fig. 5.5. Wild fleshy fungi (Cultures not submitted to DMR, Solan) by Bhubaneswar centre

Pune Centre

During the survey, in all 71 samples were collected and identified on the basis of mycological characters (Table 5.4). Among the identified samples some species belongs to genera viz. *Termitomyces* sp., *Polyporus* sp., *Clitocybe* sp. *Pleurotus* sp., *Tricholoma* sp., *Agaricus* sp. etc. were observed. The tissue isolation of the collected samples was done and in all 20 pure cultures of mushroom were successfully derived and maintained. Total 20 pure cultures of wild mushroom were deposited in the Gene Bank of Directorate of Mushroom Research, Chambaghat, Solan for accession numbers and thirteen (13) cultures obtained DMR accessions codes.



Market Survey of Poladpur, Dist : Raigad



Market Survey of Sawantwadi, Dist: Shindudurg



Pleurotus sp.



Pleurotus sp.



Leucoagaricus sp.



Hygrophorus sp.



Agaricus sp.



Tricholoma sp.

Fig. 5.6. Market survey and wild collection by Pune Centre

Table 5.4. List of wild fleshy fungi collected during Monsoon 2015-2016 by Pune Centre.

Sr. No.	Sample No.	Location	Isolate No.	DMR Accession Number	GPS data	Habitat	Cap Colour	Cap Dia (cm)	Cap Shape	Stipe attachment	Stipe length (cm)	Gill attachment	Identification
1	PN-15-01	Wada, Pune	**		La-19°00'45.57"N Lo-73°43'48.42"E	Humus	White	15.3	Round	Central	12.4	Free	<i>Lepiota</i> sp.
2	PN-15-02	Wada, Pune	PN-15-02		La-19°00'04.77"N Lo-73°44'55.50"E	Leaf litter	Whitish gray	3.1	Bell	Central	8.6	Free	<i>Chlorophyllum</i> sp.
3	PN-15-03	Wada, Pune	**		La-19°00'09.89"N Lo-73°44'39.82"E	Leaf litter	Gray brown	4.6	Umbrella	Central	5.2	Free	*
4	PN-15-04	Chandoli, Pune	PN-15-04		La-18°50'46.08"N Lo-73°52'09.83"E	Humus	White	4.3	Umbrella	Central	8.9	Free	*
5	PN-15-05	Chandoli, Pune	PN-15-05	DMRO-768	La-18°50'47.51"N Lo-73°52'08.20"E	Humus	Light brown	3.7	Bell	Central	5.6	Free	<i>Leucoagaricus</i> sp.
6	PN-15-06	Aundhe., Pune	**		La-18°57'27.90"N Lo-73°37'30.64"E	Leaf litter	Creamy white	12.3	Umbrella	Central	7.8	Free	<i>Tricholoma</i> sp.
7	PN-15-07	Aundhe, Pune	**		La-18°57'30.49"N Lo-73°37'19.98"E	Humus	Gray	15.8	Funnel	Central	16.4	Free	<i>Tricholoma</i> sp.
8	PN-15-08	A.C., Pune	**		La-18°31'15.83"N Lo-73°50'40.74"E	Leaf litter	Brown	4.3	Button	Central	4.3	Free	<i>Agaricus</i> sp.
9	PN-15-09	A.C., Pune	**		La-18°31'56.17"N Lo-73°50'70.17"E	Humus	Yellowish creamy	11.2	Depressed	Central	5.3	Adnexed	<i>Clitocybe</i> sp.
10	PN-15-10	A.C., Pune	**		La-18°31'56.17"N Lo-73°50'56.91"E	Leaf litter	Yellowish	4.4	Ovate	Central	4.1	Free	*
11	PN-15-11	A.C., Pune	**		La-18°31'56.17"N Lo-73°50'40.44"E	Leaf litter	White	3.9	Umbonate	Central	6.3	Free	*
12	PN-15-12	A.C., Pune	PN-15-12		La-18°32'08.26"N Lo-73°50'29.45"E	Leaf litter	Gray	4.3	Umbonate	Central	5.7	Adnexed	*
13	PN-15-13	A.C., Pune	**		La-18°32'08.94"N Lo-73°50'30.82"E	Tree trunk	Brisk colour	18.2	Bracket	-	-	-	<i>Ganoderma</i> sp.
14	PN-15-14	A.C., Pune	**		La-18°32'26.58"N Lo-73°50'31.55"E	Humus	Violet	5.2	Funnel	Central	5.4	Sub decurrent	<i>Hygrophorus</i> sp.
15	PN-15-15	Pune University	**		La-18°32'38.86"N Lo-73°49'42.86"E	Humus	Brownish black	4.6	Umbonate	Central	9.6	Free	<i>Tricholoma</i> sp.
16	PN-15-16	Pune University	PN-15-16	DMRO-769	La-18°32'42.13"N Lo-73°49'41.51"E	Leaf litter	Creamy	5.2	Depressed	Central	4.9	Sub decurrent	<i>Agrocybe</i> sp.
17	PN-15-17	Pune University	**		La-18°32'46.93"N Lo-73°49'37.51"E	Humus	Gray	3.7	Conical	Central	4.6	Free	<i>Volvariella</i> sp.
18	PN-15-18	Pune University	**		La-18°32'55.20"N Lo-73°49'36.13"E	Humus	Gray	12.6	Umbonate	Central	11.1	Free	<i>Tricholoma</i> sp.

Sr. No.	Sample No.	Location	Isolate No.	DMR Accession Number	GPS data	Habitat	Cap Colour	Cap Dia (cm)	Cap Shape	Stipe attachment	Stipe length (cm)	Gill attachment	Identification
19	PN-15-19	Pune University	**		La-18°32'51.09"N Lo-73°49'38.32"E	Tree trunk	Brisk red	12.2	Bracket	Lateral	6.3	Pores	<i>Ganoderma</i> sp.
20	PN-15-20	Pune University	**		La-18°32'05.45"N Lo-73°49'35.83"E	Humus	White	5.9	Convex	Central	5.2	Free	<i>Pluteus</i> sp.
21	PN-15-21	Rashiwade Bk. Kolhapur	**		La-16°32'54.97"N Lo-74°06'58.33"E	Wooden stump	Milky white	7.1	Oyster	Lateral	5.6	Decurrent	<i>Pleurotus</i> sp.
22	PN-15-22	Rashiwade Bk. Kolhapur	**		La-16°32'58.24"N Lo-74°06'58.19"E	Humus	Whitish	4.1	Convex to Ovate	Central	10.3	Subdecurrent	<i>Collybia</i> sp.
23	PN-15-23	Haldi Kolhapur	PN-15-23	DMRO-770	La-16°53'49.82"N Lo-74°09'28.83"E	Humus	White gray scaly	5.5	Ovate	Central	2.9	Free	<i>Agaricus</i> sp.
24	PN-15-24	Dewale Kolhapur	**		La-16°36'29.33"N Lo-74°09'38.90"E	Tree trunk	White	4.6	Oyster	Lateral	1.4	Decurrent	<i>Pleurotus</i> sp.
25	PN-15-25	Kothali Kolhapur	**		La-16°35'01.61"N Lo-74°08'14.52"E	Tree trunk	Creamy	5.8	Ovate	Central	4.2	Free	<i>Mycena</i> sp.
26	PN-1-26	Bhogawati Kolhapur	PN-15-26	DMRO-771	La-16°31'53.32"N Lo-74°06'33.56"E	Humus	Yellowish white	5.1	Depressed	Central	6.3	Adnexed	<i>Clitocybe</i> sp.
27	PN-15-27	Bhogawati Kolhapur	PN-15-27	DMRO-772	La-16°31'52.22"N Lo-74°06'05.80"E	Tree trunk	Pink	4.1	Oyster like	Lateral	1.8	Decurrent	<i>Pleurotus</i> sp.
28	PN-15-28	Koulav Kolhapur	**		La-16°31'14.71"N Lo-74°05'05.72"E	Tree trunk	Yellowish brown	4.2	Feathery	Lateral	4.2	Pores	<i>Polyporus</i> sp.
29	PN-15-29	Koulav Kolhapur	**		La-16°31'14.39"N Lo-74°05'01.53"E	Wood stump	Gray	5.2	Depressed	Central	10.1	Adnexed	<i>Mycena</i> sp.
30	PN-15-30	Koulav Kolhapur	PN-15-30	DMRO-773	La-16°31'03.21"N Lo-74°04'59.26"E	Humus	Brown	6.3	Depressed	Central	7.2	Adnexed	<i>Clitocybe</i> sp.
31	PN-15-31	Radhanagri Kolhapur	**		La-16°24'38.41"N Lo-73°59'00.71"E	Humus	Yellow	3.4	Funnel	Central	8.2	Decurrent	<i>Omphalia</i> sp.
32	PN-15-32	Radhanagri Kolhapur	PN-15-32		La-16°24'31.26"N Lo-73°59'05.84"E	Tree trunk	Creamy white	6.3	Oyster	Lateral	0.7	Decurrent	<i>Pleurotus</i> sp.
33	PN-15-33	Radhanagri Kolhapur	PN-15-33	DMRO-774	La-16°24'33.01"N Lo-73°58'56.60"E	Tree trunk	White	4.6	Oyster	Lateral	0.8	Decurrent	<i>Pleurotus</i> sp.
34	PN-15-34	Phondaghat Shindudurg	**		La-16°22'27.92"N Lo-73°51'35.91"E	Leaf litter	Creamy white	7.6	Cylindrical	Central	6.7	Free	<i>Coprinus comatus</i>
35	PN-15-35	Phondaghat Shindudurg	PN-15-35	DMRO-775	La-16°22'24.58"N Lo-73°51'37.34"E	Leaf Litter	White	7.3	Depressed	Central	7.9	Slightly decurrent	<i>Clitocybe</i> sp.
36	PN-15-36	Phondaghat Shindudurg	**		La-16°22'13.89"N Lo-73°51'34.16"E	Leaf Litter	Brown	5.4	Button	Central	4.2	Free	<i>Agaricus</i> sp.

Sr. No.	Sample No.	Location	Isolate No.	DMR Accession Number	GPS data	Habitat	Cap Colour	Cap Dia (cm)	Cap Shape	Stipe attachment	Stipe length (cm)	Gill attachment	Identification
37	PN-15-37	Phondaghat Shindudurg	**		La-16°22'01.72"N Lo-73°51'19.44 "E	Leaf litter	White brown centre	7.5	Truncate	Central	4.3	Free	<i>Tricholoma</i> sp.
38	PN-15-38	Phondaghat Shindudurg	PN-15-38	DMRO-776	La-16°21'30.59"N Lo-73°12'13.76"E	Humus	Creamy white	7.9	Humped	Central	8.1	Free	*
39	PN-15-39	Phondaghat Shindudurg	**		La-16°21'30.61"N Lo-73°50'48.27"E	Termitoria	Milky white	2.1	Button	Central	4.3	Free	<i>Termitomyces</i> sp.
40	PN-15-40	Phondaghat Shindudurg	PN-15-40		La-16°21'46.56"N Lo-73°50'28.52"E	Humus	Creamy White	7.8	Convex	Central	5.7	Free	<i>Leucoagaricus</i> sp.
41	PN-15-41	Tembewadi Shindudurg	**		La-16°27'43.03"N Lo-73°45'02.10"E	Humus	Gray with brown scale	6.3	Truncate	Central	6.3	Free	<i>Tricholoma</i> sp.
42	PN-15-42	Tembewadi Shindudurg	**		La-16°27'51.90"N Lo-73°45'07.88"E	Humus	Brown	6.8	Humped	Central	8.9	Free	<i>Tricholoma</i> sp.
43	PN-15-43	Tembewadi Shindudurg	**		La-16°28'59.62"N Lo-73°44'47.18"E	Humus	Dark gray	4.6	Humped	Central	4.1	Free	<i>Tricholoma</i> sp.
44	PN-15-44	Vaibhawwadi Shindudurg	PN-15-44		La-16°30'11.54"N Lo-73°45'54.75"E	Humus	Brownish gray	5.6	Humped	Central	4.3	Shortly decurrent	<i>Tricholoma</i> sp.
45	PN-15-45	Vaibhawwadi Shindudurg	**		La-16°30'18.56"N Lo-73°46'05.77"E	Wooden stump	Creamy White	4.5	Depressed	Central	4.2	Decurrent	<i>Clitocybe</i> sp.
46	PN-15-46	Bhuyadewadi Shindudurg	**		La-16°31'05.48"N Lo-73°48'16.26"E	Humus	Creamy White	4.3	Depressed	Central	3.2	Shortly decurrent	<i>Clitocybe</i> sp.
47	PN-15-47	Bhuyadewadi Shindudurg	PN-15-47	DMRO-777	La-16°31'04.06"N Lo-73°48'20.14"E	Tree trunk	Pink	5.6	Oyster	Lateral	0.9	Shortly decurrent	<i>Pleurotus</i> sp.
48	PN-15-48	Bawara Bawada Shindudurg	PN-15-48	DMRO-778	La-16°32'19.67"N Lo-73°48'36.24"E	Tree trunk	White	7.6	Oyster	Lateral	1.2	Shortly decurrent	<i>Pleurotus</i> sp.
49	PN-15-49	Bawara Bawada Shindudurg	PN-15-49		La-16°32'26.35"N Lo-73°48'47.78"E	Tree trunk	Faint gray	12.9	Oyster	Lateral	1.4	Shortly decurrent	<i>Pleurotus</i> sp.
50	PN-15-50	Bawara Bawada Shindudurg	**		La-16°32'28.03"N Lo-73°48'54.48"E	Humus	White with gray scale	5.6	Button	Central	4.3	Free	<i>Agaricus</i> sp.
51	PN-15-51	Bawara Bawada Shindudurg	PN-15-51	DMRO-779	La-16°32'20.83"N Lo-73°48'38.28"E	Leaf litter	Grayish white	5.8	Depressed	Central	5.8	Free	<i>Clitocybe</i> sp.
52	PN-15-52	Bawara Bawada Shindudurg	**		La-16°32'26.06"N Lo-73°48'48.20"E	Humus	White	3.8	Conic	Central	6.2	Free	<i>Coprinus</i> sp.
53	PN-15-53	Bawara Bawada Shindudurg	PN-15-53	DMRO-780	La-16°32'26.27"N Lo-73°49'00.47"E	Termitoria	Gray	8.2	Depressed	Central	9.4	Free	<i>Termitomyces</i> sp.

Sr. No.	Sample No.	Location	Isolate No.	DMR Accession Number	GPS data	Habitat	Cap Colour	Cap Dia (cm)	Cap Shape	Stipe attachment	Stipe length (cm)	Gill attachment	Identification
54	PN-15-54	Gagangad Kolhapur	**		La-16°32'22.67"N Lo-73°49'14.56"E	Termitoria	White	4.2	Bell	Central	10.3	Free	<i>Termitomyces</i> sp.
55	PN-15-55	Gagangad Kolhapur	**		La-16°32'15.93"N Lo-73°49'23.26"E	Humus	White	7.9	Depressed	Central	6.9	Adnet	<i>Lepiota</i> sp.
56	PN-15-56	Gaganbawada Kolhapur	**		La-16°31'52.33"N Lo-73°49'57.69"E	Humus	Yellowish	3.9	Conic	Central	4.9	Adnased	<i>Leucoagaricus</i> sp.
57	PN-15-57	Gaganbawada Kolhapur	**		La-16°32'01.25"N Lo-73°49'56.68"E	Humus	Gray	7.9	Depressed	Central	9.8	Free	<i>Tricholoma</i> sp.
58	PN-15-58	Gaganbawada Kolhapur	**		La-16°32'13.26"N Lo-73°49'53.16"E	Humus	Coffee	8.6	Truncate	Central	5.4	Free	<i>Oudemansiella</i> sp.
59	PN-15-59	Aslaj Kolhapur	**		La-16°35'59.24"N Lo-73°53'27.86"E	Leaf litter	Creamy	4.9	Circular	Central	4.6	Free	*
60	PN-15-60	Aslaj Kolhapur	**		La-16°36'10.74"N Lo-73°53'25.73"E	Humus	Yellowish	3.9	Circular	Central	6.8	Free	*
61	PN-15-61	Shenawade Kolhapur	**		La-16°38'03.56"N Lo-73°56'01.79"E	Wooden stump	Yellowish red	7.5	Funnel	Central	2.5	Pores	<i>Stereum</i> sp.
62	PN-15-62	Salwan Kolhapur	**		La-16°41'17.67"N Lo-73°59'35.18"E	Humus	Whitish	4.3	Convex	Central	9.3	Subdecurrent	<i>Mycena</i> sp.
63	PN-15-63	Salwan Kolhapur	**		La-16°41'17.61"N Lo-73°59'46.74"E	Humus	Dark gray	-	String	-	-	-	<i>Xylaria</i> sp.
64	PN-15-64	Kirve Kolhapur	**		La-16°41'25.06"N Lo-74°00'45.14"E	Wooden stump	Yellow green	9.2	Fan	-	-	Pores	<i>Trametes versicolor</i>
65	PN-15-65	Kirve Kolhapur	**		La-16°41'38.83"N Lo-74°00'56.81"E	Leaf litter	Brisk red	3.5	Convex	Central	4.2	Free	<i>Camarophyllus</i> sp.
66	PN-15-66	Mukteshwar Kolhapur	**		La-16°41'57.27"N Lo-74°01'11.09"E	Humus	Dark Pink	3.4	Elliptical	Central	5.9	Free	*
67	PN-15-67	Asgaonx Kolhapur	**		La-16°42'35.26"N Lo-74°02'37.30"E	Humus	Creamy white	8.9	Truncaet	Central	4.1	Free	<i>Lactarius</i> sp.
68	PN-15-68	Asgaon Kolhapur	**		La-16°42'27.19"N Lo-74°03'57.43"E	Tree trunk	Milky White	2.8	Oyster	Lateral	1.2	Decurrent	<i>Pleurotus</i> sp.
69	PN-15-69	A.C., Kolhapur	**		La-16°41'18.78"N Lo-74°15'32.54"E	Humus	Gray	2.8	Convex	Central	8.7	Adnexed	<i>Coprinus</i> sp.
70	PN-15-70	A.C., Kolhapur	**		La-16°41'16.03"N Lo-74°15'32.36"E	Sand	Yellow	-	Strings	-	0.5	-	<i>Clavaria</i> sp.
71	PN-15-71	A.C., Kolhapur	**		La-16°41'15.80"N Lo-74°15'34.30"E	Humus	Creamy	-	Strings	-	2.2	-	<i>Ramaria</i> sp.

** Pure culture not obtained*unidentified

Total no. of wild fleshy fungi collected = 71

No. of wild fleshy fungi cultures sent to DMR, Solan = 20

No. of wild fleshy fungi cultures obtained DMR Accession codes = 13

Raipur Centre

Extensive surveys of fleshy fungi were conducted in various location of Chhattisgarh including forest area and local market. The mushrooms were collected from different habitat like forest rotten straw heaps, decaying wood etc. The fungi were also collected from local markets of Raipur, Kanker Gariyaband, Jagdalpur, Jashpur . Site of collection and other information were obtained from seller, village chief and local men and women. Each collected samples were wrapped in paper and brought to the laboratory for identification. Identification of each sample was done very meticulously with the help of standard manuals. Both microscopic and macroscopic characters were recorded with due care. The collected samples were preserved in 4% formalin solution Spore print and dried samples of have also been preserved. The detailed information regarding the wealth of edible macro-fungi in Chhattisgarh has been documented and is given in Table 5.5.

Table 5.5. Wild edible mushroom collection, identification and conservation.

Sl. No.	Accession No	Name of fungi	Habitat/ Substrates	Place	Month of collection	Edibility	Designation
1	IGKV-CI1 N 21° 15.714' E 81° 34.765' Altitude 1094ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Peepal Tree Rhizosphere region	Raipur Dharampura	13.08.2015	Edible	DMRO-747 Shukla C. S. and Singh H. K.
2	IGKV-CI2 N 20°13.412' E 81°2.738' Altitude 1240ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Peepal Tree Rhizosphere region	Kanker	09.08.2015	Edible	DMRO-748 Shukla C. S. and Singh H. K.
3	IGKV-CI3 N 20° 43.388' E 81° 59.612' Altitude 1215ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Peepal Tree Rhizosphere region	Gariyaband Bhamni Forest	11.08.2015	Edible	DMRO-749 Shukla C. S. and Singh H. K.
4	IGKV-CI4 N 21° 12.945' E 82° 12.828' Altitude 1036ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Karanj Tree Rhizosphere region	Sirpur forest	27.08.2015	Edible	DMRO-750 Shukla C. S. and Singh H. K.
5	IGKV-CI5 N 21° 16.717' E 81° 34.660' Altitude 1096ft	<i>Calocybe indica</i> * Milky mushroom	In between branches of Peepal tree	Raipur, Professor Colony	14.08.2015	Edible	DMRO-751 Shukla C. S. and Singh H. K.
6	IGKV-WV1 N 21° 16.717' E 81° 34.660' Altitude 1096ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Raipur, NSP Farm	27.07.2015	Edible	DMRO-739 Shukla C. S. and Singh H. K.
7	IGKV-WV2 N 21°48.374' E 81°28.036' Altitude 963ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Sagonasaj Bemetra	19.08.2015	Edible	DMRO-740 Shukla C. S. and Singh H. K.
8	IGKV-WV3 N 23°36.865' E 81°38.423' Altitude 856ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Tereya Bemetra	19.08.2015	Edible	DMRO-741 Shukla C. S. and Singh H. K.

Sl. No.	Accession No	Name of fungi	Habitat/ Substrates	Place	Month of collection	Edibility	Designation
9	IGKV-VV4 N 21°58.957' E 81°18.327' Altitude 1087ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Birkona Kawardha	19.08.2015	Edible	DMRO-742 Shukla C. S. and Singh H. K.
10	IGKV-VV5 N 22°06.845' E 81°09.049' Altitude 1474ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Chapri, Bondla, Kawardha	19.08.2015	Edible	DMRO-743 Shukla C. S. and Singh H. K.
11	IGKV-VV6 N 21°58.957' E 81°18.327' Altitude 1087ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Birkona Kawardha	19.08.2015	Edible	DMRO-744 Shukla C. S. and Singh H. K.
12	IGKV-VV7 N 21° 16.717' E 81° 34.660' Altitude 1096ft	<i>Volvariella volvacea</i> * Paddy straw mushroom	Decomposed Paddy straw heap	Raipur, NSP Farm	27.07.2015	Edible	DMRO-745 Shukla C. S. and Singh H. K.
13	IGKV-L1 N 20°43.388' E 81°59.612' Altitude 1215ft	<i>Lentinus sajor-caju</i> *	Wood logs of Saja tree	Gariyaband Bhamni Forest	11.08.2015	Edible	DMRO-737 Shukla C. S. and Singh H. K.
14	IGKV-L2 N 20°35.412' E 81°02.155' Altitude 1240ft	<i>Lentinus</i> spp. *	Wood logs of Saja tree	Gariyaband Bhamni Forest	11.08.2015	Edible	DMRO-738 Shukla C. S. and Singh H. K.
15	IGKV-VV1 N 22°08.308' E 81°08.803' Altitude 2019ft	<i>Amanita virosa</i> *	Leaf litter, beneath tree	Banjari Forest Kawardha	19.08.2015	Edible	DMRO-746 Shukla C. S. and Singh H. K.
16	IGKV-Te1 N 20°35.451' E 82°02.145' Altitude 1225ft	<i>Termitomyces</i> **	Termitorium	Gariyaband Bhamni Forest	11.08.2015	Edible	Shukla C. S. and Singh H. K.
17	IGKV-Te2	<i>Termitomyces</i> **	Shastri market Raipur	Shastri market Raipur	29.07.2015	Edible	Shukla C. S. and Singh H. K.
18	IGKV-Sc1	<i>Scleroderma</i> spp.***	Shastri market Raipur	Shastri market Raipur	29.07.2015	Edible	Shukla C. S. and Singh H. K.
19	IGKV-Ra N 22°08.308' E 81°08.803' Altitude 2019ft	<i>Rassula</i> spp.***	Leaf litter, beneath tree	Banjari Forest Kawardha	19.08.2015	Edible	Shukla C. S. and Singh H. K.

* Culture, Photographs, Spore-print, Passport data and Dried specimens deposited in DMR, Solan

** Photographs, Spore-print, Passport data and Dried specimens deposited in DMR, Solan

*** Photographs, Passport data and Dried specimens deposited in DMR, Solan



Fig. 5.7. Diversity of Milky mushroom from Chhattisgarh

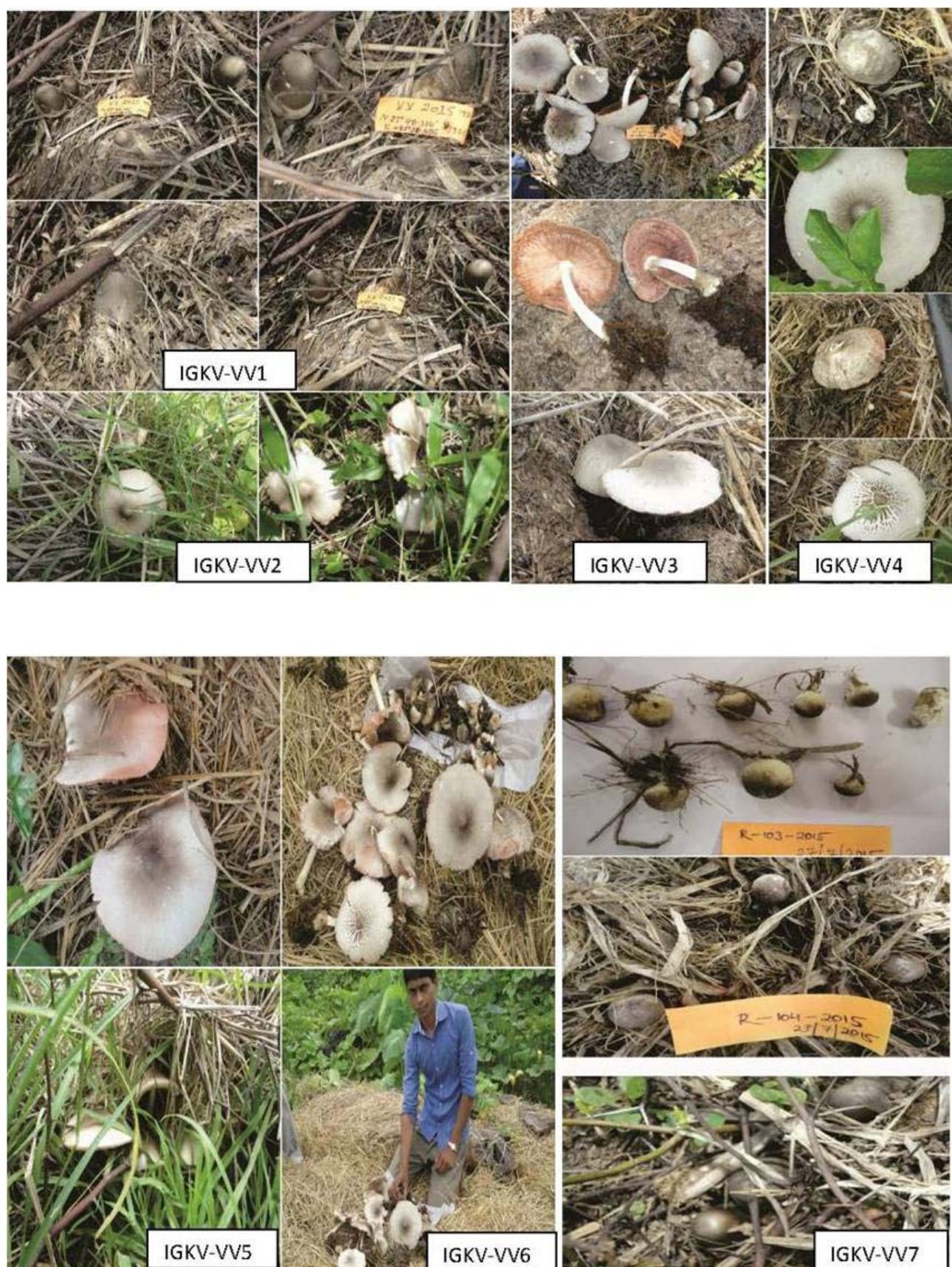


Fig. 5.8. Diversity of Paddy Straw mushroom (*Volvariella volvacea*) from Chhattishgarh





Fig. 5.9. Mushroom diversity from Raipur market



Fig. 5.10. Termitomyces from Chattishgarh



Fig. 5.11. Russula, Amanita and Lentinus collections from Chhattishgarh



Fig. 5.12. *Lentinus sajor-caju* cultured in test tube (PDA slants) and cultivated on wheat straw (BE>150%) at Raipur centre

Udaipur Centre

Total Eight Survey 's were conducted for collection, identification and conservation of wild edible mushrooms during monsoon season of 2015 in the month of July, August and September (Table 5.6 and 5.8). Total of 14 different wild mushrooms specimens were collected from Bassi forest, Anadara forest, Pratapgarh forest, Kota-Bundi forest, Sumerpur, Pali, and Udaipur forest. Some important edible mushrooms collected were *Podaxis pistillaris*, *Leucopaxillus giganteus*, *Phellorinia inquinans*, *Agaricus spp.*, *Ganoderma lucidum*, *Agaricus spp.*, *Polypore morri*, *Clitocybe spp.*, *Clitocybe geotropa*, *Gymnopilus penetrans*, *Polypore badiusi*, *Piptoporus betulinus*, *Pleurotus spp.*, and *Volvariella spp.*

Table 5.6. Culture's (14) Deposited to DMR Solan.

1	<i>Podaxis pistillaris</i>	DMRO-752	Dr Anila Doshi (Raj) UD-01/15	15-12-16
2	<i>Leucopaxillus giganteus</i>	DMRO-753	Dr Anila Doshi (Raj) UD-02/15	15-12-16
3	<i>Phellorinia inquinans</i>	DMRO-754	Dr Anila Doshi (Raj) UD-06/15	15-12-16
4	<i>Agaricus spp.</i>	DMRO-755	Dr Anila Doshi (Raj) UD-08/15	15-12-16
5	<i>Ganoderma lucidum</i>	DMRO-756	Dr Anila Doshi, (Raj) UD-12/15	15-12-16
6	<i>Agaricus spp.</i>	DMRO-757	Dr Anila Doshi, (Raj) UD-16/15	15-12-16
7	<i>Polypore morri</i>	DMRO-758	Dr Anila Doshi, (Raj) UD-18/15	15-12-16
8	<i>Clitocybe spp.</i>	DMRO-759	Dr Anila Doshi, (Raj) UD-22/15	15-12-16
9	<i>Clitocybe geotropa</i>	DMRO-760	Dr Anila Doshi, (Raj) UD-34/15	15-12-16
10	<i>Gymnopilus penetrans</i>	DMRO-761	Dr Anila Doshi, (Raj) UD-35/15	15-12-16
11	<i>Polypore badiusi</i>	DMRO-762	Dr Anila Doshi, (Raj) UD-44/15	15-12-16
12	<i>Piptoporus betulinus</i>	DMRO-763	Dr Anila Doshi, (Raj) UD-47/15	15-12-16
13	<i>Pleurotus spp.</i>	DMRO-764	Dr Anila Doshi, (Raj) UD-48/15	15-12-16
14	<i>Volvariella spp.</i>	DMRO-767	Dr Anila Doshi, (Raj) UD-07/15	15-12-16

From local market of Jaisalmer, Bikaner, Sirohi, Pali, Jodhpur, Falodi, Bajju, Chinu, Bikampura, Nachna, Kolyat,, Srimohangarh, Bap., Khirwa, Pokran, Shergarh, Balisar, Mandora, Falna, Khudala, Sadri, Sumerpur, Shivganj, Pindwara, Ranakpur, Sayra, Chachju, ungal and Aagoliya area were surveyed (Table 5.7). For local mushroom sold in market/sabgi mandi . It was observed that *Phellorinia spp* were collected by local peoples and sold in local market in wet form at the rate of Rs 200/Kg and Rs. 800/kg in the form of dry chips. Further, *Podaxis pistillaris* was used by the local people for vegetable but not sold in the local market.

Table 5.7. Specimens (20) Deposited to DMR Solan

S. No.	Specimens No.	Name of Mushroom	S. No.	Specimens No.	Name of Mushroom
1	UD-01/15	<i>Podaxis pistillaris</i>	11	UD-30/15	<i>Tyromyces caesius</i>
2	UD-02/15	<i>Leucopaxillus giganteus</i>	12	UD-35/15	<i>Gymnopilus penetrans</i>
3	UD-03/15	<i>Lepiota spp.</i>	13	UD-36/15	<i>Inonotus radiatus</i>
4	UD-06/15	<i>Phellorinia inquinans</i>	14	UD-37/15	<i>Ganoderma applanatum</i>
5	UD-16/15	<i>Agaricus spp.</i>	15	UD-39/15	<i>Schizophyllum commune</i>
6	UD-17/15	<i>Clitocybe spp</i>	16	UD-40/15	<i>Agaricus spp.</i>
7	UD-18/15	<i>Polypore morri</i>	17	UD-41/15	<i>Coltricia spp.</i>
8	UD-21/15	<i>Lepiota spp.</i>	18	UD-44/15	<i>Polypore badius</i>
9	UD-22/15	<i>Clitocybe spp.</i>	19	UD-46/15	<i>Coriolus versicolor</i>
10	UD-29/15	<i>Ganoderma luciduim</i>	20	UD-47/15	<i>Piptoporus betulinus</i>

Table 5.8. Collection, Identification and Conservation of Wild Edible Mushrooms

S. No.	Name of Mushroom	Date of Collection	Substrate	GPS Data
Ud-01/15	<i>Podaxis pistillaris</i>	28-06-2015	On soil/on sand	N-23°34.029'; E-074°09.229'Elevation- 637m
Ud-02/15	<i>Leucopaxillus giganteus</i>	15-07-2015	On collar region of bargad	N-23°34.029'; E-074°09.229'Elevation- 586m
Ud-06/15	<i>Phellorinia inquinans</i>	01-08-2015	On soil	N-23°34.029'; E-074°09.229'Elevation- 602m
Ud-07/15	<i>Volvariella spp.</i>	01-08-2015	On soil	N-23°34.029'; E-074°09.229'Elevation- 602m
Ud-08/15	<i>Agaricus spp.</i>	01-08-2015	On soil	N-24°33.985'; E-073°47.947'Elevation- 565 m
Ud-12/15	<i>Ganoderma spp</i>	01-08-2015	On dead wood babool	N-24°33.985'; E-073°47.947'Elevation- 565 m
Ud-16/15	<i>Agaricus spp.</i>	01-08-2015	On soil	N-24°40.365'; E-073°40.230'Elevation- 768 m
Ud-18/15	<i>Polypore morri</i>	04-08-2015	Dead wood	N-24°40.365'; E-073°38.230'Elevation- 694 m
Ud-22/15	<i>Clitocybe spp.</i>	04-08-2015	On soil	N-24°40.365'; E-073°38.230'Elevation- 694 m
Ud-34/15	<i>Clitocybe geotropa</i>	28-08-2015	On dead wood	N-24°35.987'; E-074°35.135'Elevation-438 m
Ud-35/15	<i>Gymnopilus penettans</i>	28-08-2015	On dead wood	N-24°35.987'; E-074°35.135'Elevation-438 m
Ud-44/15	<i>Polypore baduis</i>	28-08-2015	On dead wood	N-24°13.683'; E-074°25.664'Elevation-416 m
Ud-47/15	<i>Piptoporus betulinus</i>	28-08-2015	On dead wood	N-24°13.683'; E-074°25.664'Elevation-416 m
Ud-48/15	<i>Pleurotus spp.</i>	01-09-2015	On ratanjot	N-24°13.703'; E-074°25.632'Elevation-874 m



Fig. 5.13. Mushroom diversity collected and identified by Udaipur centre

Vellayani Centre

Collection identification and conservation of wild edible mushrooms

Surveys were conducted before and after the south west monsoons in 6 different districts A total of 54 specimens were obtained. These were isolated and brought in to pure culture. Duplicate specimen were discarded. Cultures of 18 specimens were sent to DMR in 2 sessions. Accession numbers were obtained for 8 cultures only (Table 5.9 and 5.10).

Table 5.9. Germplasm collected by Vellayani centre

S. No.	Name of Mushroom	Date of Collection	Locality	Substrate	GPS Data
1	<i>Lentinula edodes</i>	15-5-2015	Pantnagar	Wooden stump	Latitude 29.02 Longitude 79.48
2	<i>Lentinula edodes</i>	15-5-2015	Pantnagar	Wooden stump	Latitude 29.02 Longitude 79.48
3	<i>Lentinula edodes</i>	15-5-2015	Pantnagar	Wooden stump	Latitude 29.02 Longitude 79.48
4	<i>Lentinula edodes</i>	15-5-2015	Pantnagar	Wooden stump	Latitude 29.02 Longitude 79.48
5	<i>Termitomyces</i>	7-10-2015	Malapuram	Sand	Latitude 11.5 Longitude 76
6	<i>Macro lepiota</i>	13-9-2015	Vellayani	Humus	Latitude 11.70 Longitude 76.98
7	Puff ball	27-10-2015	Vellayani	Humus	Latitude 11.70 Longitude 76.98
8	<i>Agaricus</i>	29-10-2015	Vellayani	Humus	Latitude 11.70 Longitude 76.98

Table 5.10. Accession number obtained from DMR for the collected isolates

Sl.No	DMR Code	Lot number
1	DMRO 725	VLYN-15- LE-16
2	DMRO 726	VLYN-15- LE-22
3	DMRO 727	VLYN-15- LE-28
4	DMRO 728	VLYN-15- LE-38
5	DMRO 789	VLYN -16-99
6	DMRO 790	VLYN -16-103
7	DMRO 791	VLYN -16-110
8	DMRO 792	VLYN -16-111

*Termitomyces* (VLYN -16-99)*Macrolepiota* (VLYN -16-103)

Puff ball (VLYN -16-110)

*Agaricus**L. edodes* (VLYN-15- LE-16)*L. edodes* (VLYN-15- LE-22)*L. edodes* (VLYN-15- LE-28)*L. edodes* (VLYN-15- LE-38)

Fig. 5.14. Germplasm collected by Velleyani centre

Ranchi Centre

During the rainy season, one strains of *Pleurotus* sp. was collected and isolated from the mango orchard and culture was purified and passport data were generated and then cultured was deposited and DMR allotted the acc. no of the culture i.e. *Pleurotus* culture is DMRP-329. Yield evaluation of the isolated strains was also evaluated at Ranchi condition during November, 2015 and showed 75% biological efficiency in a single harvesting.

The groups of tribal women go for hunting of wild edible mushrooms in the rainy season. During rainy season they earned nearly 3000-4000/- depending upon collection. In the wild edible mushrooms, Rugra or Puttu (*Geastrum*), *Termitomyces* (Khukri) have greater proportion in their collection while other wild edible mushroom viz., Jamun Khukhari (*Boletus*), Amanita, Oyster and *Macrolapiota* in little proportion. Rugra and *Termitomyces* were sold at a premium price as compared to other mushrooms like Jamun Khukhari (*Boletus*), Oyster and *Macrolapiota* etc. As per view of the consumers of wild edible mushroom, the tastes of wild edible mushroom are very unique and ultimate as compared to cultivated mushrooms



Fig. 5.15. Fruiting bodies of *Pleurotus* sp. (Oyster/Dhingri mushroom) on the mango tree *in situ*



Fig. 5.16. Wild edible mushroom in the local market of Ranchi, Jharkhand during rainy season

Pasighat Centre

In the month of May and June 2015 market survey was conducted during after rains. Local peoples are collecting the mushroom from edible fruit trees of various places and sold in the market the price of the mushroom was increased to Rs. 200/ kg (Table 5.11). If the edible mushroom spp. appears on the non edible fruit trees it caused them gastroentero problem (It is indigenous technology of local tribal peoples). Five places viz., Pasighat, Rayang, Dipa, Yagrun and Kiyit village were selected for operation. Tribal peoples are collecting the mushroom from the edible fruit trees. If the edible mushroom spp. appears on the non edible fruit trees it caused them gastroentero problem. Those people have eaten a boil mushroom only along with some leafy vegetables also taken as a boil form. The entire edible species are attempted to culture in the laboratory. The twenty one mushroom species were collected from different parts of Arunachal Pradesh. The species immediately cultured on medium and after some time they spoiled due to electricity problem.

Table 5.9. Market survey after rainy days

S.No	Date of Visit	Mushroom sp	Rs./kg
1.	15 th May, 2015	Oyster	200
2.	20 th June, 2015	Oyster, Shiitake	200, 180
3.	30 th June, 2015	Oyster, Shiitake	200, 180

Additional all the poisonous and edible mushrooms species are documented and preserved in the mushroom museum (Department of Plant Protection, Section-Plant Pathology, Spawn and Mushroom Production Laboratory, College of Horticulture and Forestry, CAU, Pasighat) for ready reference (as far as this supplementary than 250 species are reserved in the museum). The twenty one mushroom species were collected from different parts of Arunachal Pradesh. The species immediately cultured on medium and after some time they spoiled due to electricity problem. The edible mushrooms are surveyed and the details Photographs are given below.



Fig. 5.17. Market survey was conducted on 15 May, 20 June and 30 June 2015, Shiitake mushroom in the market

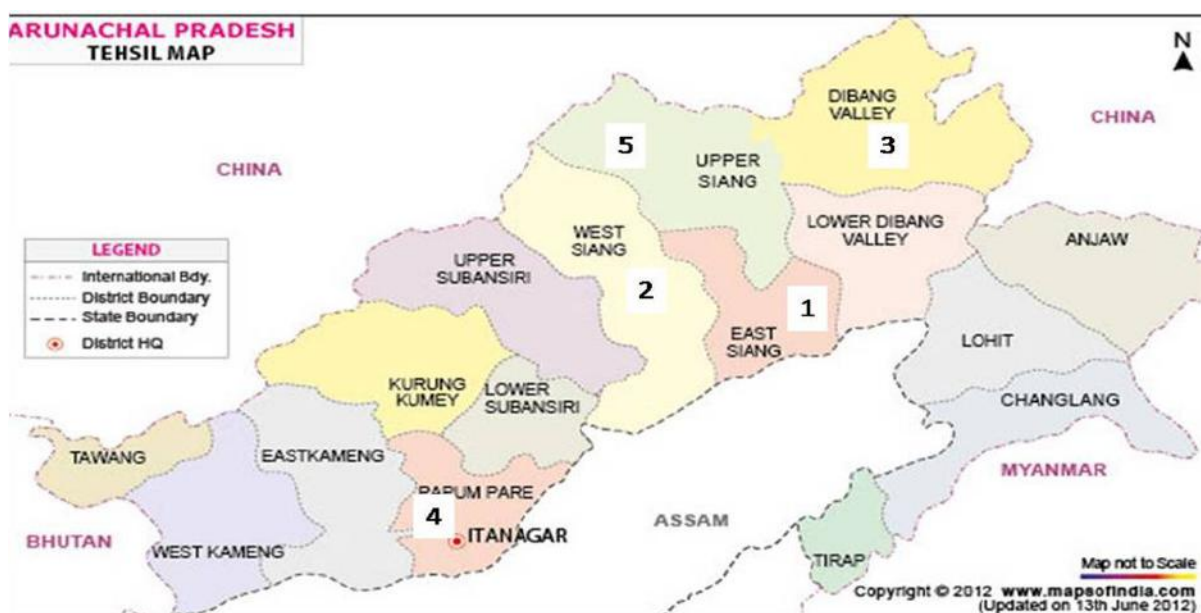


Fig. 5.18. Areas surveyed in Arunachal Pradesh for collection of germplasm (1. East Siang; 2. West Siang; 3. Dibang valley; 4. Papum pare; 5. Siang)



Fig. 5.19. Wild mushroom specimens collected by Pasighat centre



Fig. 5.20. Wild mushroom specimens collected by Pasighat centre

Pusa Centre

The survey was conducted during the year 2015-16 in Samastipur & Muzaffarpur district of Bihar. A total of 5 germplasm were collected and identified. They were cultured on PDA and attempt will be made for cultivation (Table 5.12).

Table 5.12. Germplasm collected at Pusa centre

Sl. No.	Locality	Germplasm	Habitat	No.	Month
1	Samastipur - Bishunpur	<i>Termitomyces</i> sp.	Soil (open field)	1	24 Oct, 2015
2	Samastipur – kaijia	<i>Ganoderma</i> sp.	Bamboo	1	21 July 2015
3	Samastipur – Pusa Harpur	<i>Auricularia auricula</i>	Guava	1	30 July 2015
4	Muzaffarpur – Tepari	<i>Calocybe indica</i>	Pipal tree	1	11 Aug, 2015
5	Muzaffarpur – Mutlupur	<i>Tricholoma gignitium</i>	Pipal tree	1	22 May, 2015



Fig. 5.21. Germplasm collected by Pusa centre

Pantnagar Centre

During Rainy Season (July-Sept, 2015), Ramnagar, Dhumakot, Kalsi & Chakrata (Deharadun), Khatima, Gularbhoj, and adjacent forest area were surveyed and a total of 51 specimens were collected during season. Out of 51 wild specimens collected, 48 specimens were submitted to ICAR-DMR culture bank while 11 spore prints and 11 cultures were also submitted (Table 5.13).

Table 5.13. List of accessions number allotted

Sl. No.	Acc. No.	Sample No.	Species	Collector's Name	Allotment date
1.	DMRO-793	Pant 01/15	<i>Pleurotus</i> sp.	Dr Kushwaha, and Dr Mishra	09-04-16
2.	DMRO-797	Pant 05/15	<i>Auricularia</i> sp.	Dr Kushwaha, and Dr Mishra	09-04-16
3.	DMRO-803	Pant 13/15	<i>Tricholoma</i> sp.	Dr Kushwaha, and Dr Mishra	09-04-16
4.	DMRO-801	Pant 14/15	<i>Boletus</i> sp.	Dr Kushwaha, and Dr Mishra	09-04-16
5.	DMRO-794	Pant 20/15	unknown	Dr Kushwaha, and Dr Mishra	09-04-16
6.	DMRO-798	Pant 24/15	<i>Tricholoma/Calocybe</i>	Dr Kushwaha, and Dr Mishra	09-04-16
7.	DMRO-799	Pant 27/15	<i>Polypore</i>	Dr Kushwaha, and Dr Mishra	09-04-16
8.	DMRO-795	Pant 32/15	<i>Macrolepiota</i> sp.	Dr Kushwaha, and Dr Mishra	09-04-16
9.	DMRO-800	Pant 46/15	<i>Pleurotus</i>	Dr Kushwaha, and Dr Mishra	09-04-16
10.	DMRO-796	Pant 48/15	<i>Lentinus</i> sp.	Dr Kushwaha, and Dr Mishra	09-04-16
11.	DMRO-802	Pant 49/15	Unknown	Dr Kushwaha, and Dr Mishra	09-04-16



Pant 1/15



Pant 2/15



Pant 3/15



Pant 4/15



Pant 5/15



Pant 6/15



Pant 7/15



Pant 8/15



Pant 9/15



Pant 10/15



Pant 11/15



Pant 12/15



Pant 13/15



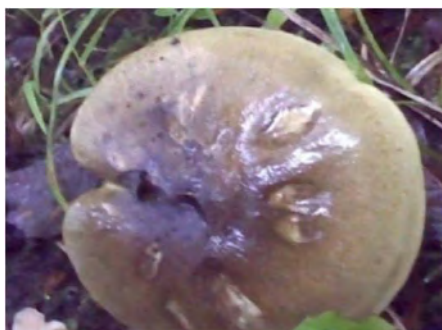
Pant 14/15



Pant 15/15



Pant 16/15



Pant 17/15



Pant 18/15



Pant 19/15



Pant 20/15



Pant 21/15



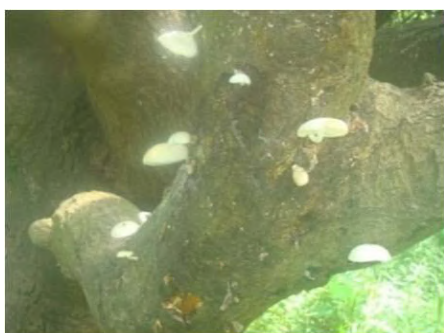
Pant 22/15



Pant 23/15



Pant 24/15



Pant 25/15



Pant 26/15



Pant 27/15



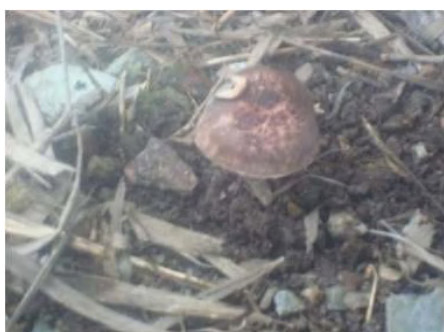
Pant 28/15



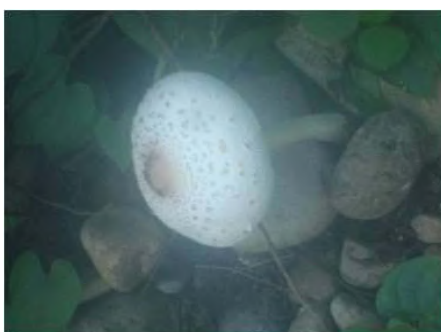
Pant 29/15



Pant 30/15



Pant 31/15



Pant 32/15



Pant 33/15



Pant 34/15



Pant 35/15



Pant 36/15



Pant 37/15



Pant 38/15



Pant 39/15



Pant 40/15



Pant 41/15



Pant 42/15



Pant 43/15



Pant 44/15



Pant 45/15



Fig. 5.21. Mushroom germplasm collected by Pantnagar centre

IIHR Bangalore Centre

During the season one wild specimen was collected, cultured and studied. The photographs of the specimen is given in Fig. 5.22. The specimen was collected from Nagenhalli, Bangalore North and Siddapura, Bangalore south at coordinates of 77.5983° E & 77.58988° E, 13.1139° N & 12.9450719° N and altitude of 915 meters.

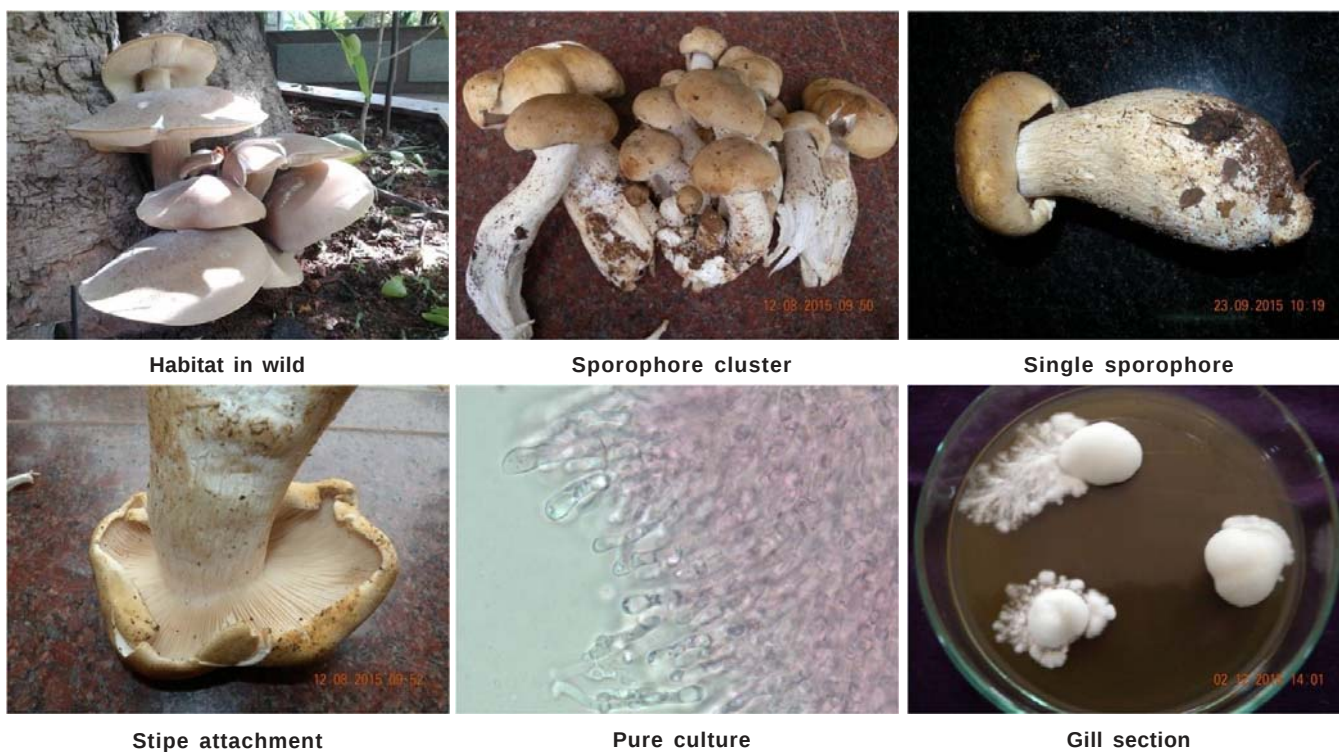


Fig. 5.22. Wild collection by IIHR Bangalore

HAIC Murthal Centre

During the season three wild mushrooms were collected by HAIC Murthal Centre. The photographs are given in Fig. 5.23.



Fig. 5.23. Wild mushroom collected by HAIC Murthal Centre

SKAUST, Jammu Centre

Surveys were conducted in Udhampur and Doda districts during the month of July-August, 2015 to collect wild edible mushrooms of the region. During the surveys, samples of *Russula* spp., *Flammunila* spp., *Sparassis* spp., *Helvella* spp., *Ramaria* spp., *Morchella* spp. were collected. Spot photographs of the samples in wild were taken. The samples were brought to the laboratory. Fresh samples of mushrooms were cultured and fruit bodies have also been preserved in the newly established mushroom museum of the centre.



Fig. 5.24. Wild Mushroom Flora collected by Jammu Centre

Kalyani Centre

Surveys were conducted during the month of August, September 2015 in districts of Nadia (22° 42' 21.2796" N 88° 45' 10.8288" E), 24 Paragnas North (22° 37' 0.516" N 88° 24' 10.422" E), Hoogly (22° 53'

9.1572" N88° 23' 30.8508" E) and Darjeeling (27° 2' 9.6252" N88° 15' 45.63" E and klempong (27° 3' 33.6816" N88° 28' 10.0308" E) Siliguri (26° 43' 37.5636" N88° 23' 43.0296" E) samples of wild edible mushroom consumed by local population were collected. A total number of 8 specimens of gilled fungi and polypores have been collected and tentatively identified as *Pleurotus ostreatus*, *Volvariella volvacea*, *Pleurotus* sp., *Ganoderma lucidum*, *Termitomyces microcarpus*, *Calocybe indica*. and others could not be identified aptly. Characters for mushroom identification have been noted and efforts are being made to identify the mushroom samples. Cultures along with data shall be provided to the nodal centre after properly identifying the samples. Isolation and pure culturing of these fungi have been made in PDA and Mushroom growth medium. Spore prints and dry specimens wherever possible were preserved.



Fig. 5.25. Wild Mushroom flora collected by Kalyani centre

Manipur Centre

Survey for collection of mushrooms from different districts of Manipur was undertaken during the months of July, August, September 2015 and April, May 2016. A total of 38 different mushroom specimens were collected, out of which pure culture/dried specimen of 6 mushrooms are to be submitted to ICAR-DMR during workshop. The detailed data for these six specimens are given in Table 5.14.

Table 5.14. Details of mushroom collection

Number of mushroom specimens collected	Number of specimens for which pure culture is obtained	Number of specimens to be deposited to ICAR-DMR
38	4	6



Fig. 5.26. Biodiversity of Mushroom collected by Manipur Centre



Fig. 5.27. Biodiversity of Mushroom collected by Manipur Centre

Mizoram Centre

During the season, a total of four specimens were collected from market and four specimens were collected from wild (Table 5.15).

Table 5.15. Market data of mushroom collected by Mizoram centre

Sl. No.	Information	Observation/data /Specimen No.			
		1	2	3	4
1.	Name/market/District	Diakkawn Kolasib market	Diakkawn Market Kolasib	Diakkawn Market Kolasib	Diakkawn Market Kolasib
2.	Date of collection	16/6/2015	16/6/2015	6/8/2015	18/8/2015
3.	Sale price (Rs./kg)	500	500	500	500
4.	Any association with tree (s)/soil type etc. (interact with collector if possible)	Wooden stump and tree	Soil	Bamboo	Wooden stump or tree
5.	ITK if any				
6.	Temperature range during the collection period (15-20, 20-25, 25-30, 30-35°C)				

Wild specimens of mushroom were collected from Kolasib and champhai locality of Mizoram at latitude of 24°13.366N, 24°21'54.1N, 24°17.78333N, and 23°31.446N; Longitude of 092°40.766E, 92°6'50.41E, 092°6'28.467E and 093°10.828E, and at altitude of 2102 ft , 2135 ft, 2236 ft and 3841 ft, respectively.



Wild mushroom collection by Mizoram Centre



Fig. 5.28. Locally Available different types of Mushroom in Kolasib, Mizoram during rainy season

Nagaland Centre

Some of the naturally growing seasonal mushrooms were collected and reported during the period at Jharnapani, Dimapur, Nagaland.



Fig. 5.29. Some collection of wild mushroom by Nagaland centre

Farmers of the Nagaland, sell the edible mushrooms in market place during the season. The following mushrooms were collected by the farmers from the forests which are growing naturally in their locality.



Fig. 5.30. Documentation of locally available edible mushroom at market

Sikkim Centre

Five mushroom species (Chamrae cheo, Kannae cheo, Kane cheo, Chiplae cheo and Chanterelle mushroom) were collected from Sikkim and four cultures were sent to the ICAR-DMR, Solan. Among the four cultures sent three cultures were identified and accession numbers were given as, DMRO-734, DMRO-735 and DMRP-359.



Fig. 5.31. Wild mushroom collection by Sikkim Centre

VPKAS Almora Centre

Single edible mushroom was collected during the month of November and it was identified as *Morchella* sp. The specimen was collected from Experimental farm, Hawalbagh, Almora at coordinates of 29°37'59.8" N; 79°37'51.5"E and at an altitude of 1200 m msl.



Fig. 5.32. *Morchella* sp. collected from Almora

6. EXTENSION ACTIVITIES

Bhubaneswar Centre

Generation of databases of mushroom farmers, spawn producers and total production of spawn and mushroom in your state

Table 6.1. Status of Mushroom in Odisha

Sl. No.	Particulars	Information/ Production (t/year)	% of total production
1.	Paddy straw mushroom	8331	66
2.	Oyster mushroom	4165	33
3.	Button mushroom	126	1
4.	Total mushroom production	12,622	100
5.	No. of spawn production units	216	-
6.	Total spawn production	2368	-
7.	No. of processing units	2	-

*Updated till 31.03.2015

Training, Demonstration and Mass Communication

During 2015-16, 17 trainings including 10 of AICRP on Mushroom with a total of 494 trainees have been conducted on mushroom cultivation and processing and mushroom spawn production at OUAT, Bhubaneswar. Lecture-cum-demonstration programme were attended at 35 locations involving 2938 trainees on mushroom cultivation, out of which 928 were ladies belonging to different self help groups. The centre participated in five Krishi exhibitions. Besides, eight TV programmes were under taken during the period on mushroom cultivation and processing and spawn production. The scientist also participated in 12 farmer-scientist interaction programme.

Table 6.2. On-campus Training: AICRP on Mushroom, Bhubaneswar

Sl. No.	Date	Venue	No. of farmers participated	Particulars	No. of lady participants
1.	4.05.15-8.05.15	OUAT	49	Mushroom cultivation and processing	2
2.	6.06.15-15.06.15	OUAT	16	Mushroom spawn production	4
3.	8.06.15-12.06.15	OUAT	43	Mushroom cultivation and processing	7
4.	12.08.15-21.08.15	OUAT	18	Mushroom spawn production	3
5.	13.08.15-17.08.15	OUAT	26	Mushroom cultivation and processing	3
6.	14.09.15-23.09.15	OUAT	09	Mushroom spawn production	2
7.	25.09.15-29.09.15	OUAT	33	Mushroom cultivation and processing	8
8.	12.01.16-16.01.16	OUAT	37	Mushroom cultivation and processing	8
9.	15.02.16.-19.02.16	OUAT	46	Mushroom cultivation and processing	6
10.	17.03.16-26.03.16	OUAT	15	Mushroom spawn production	4
	Total		292		47(16%)

Table 6.3. On-campus Training: CTMRT, Bhubaneswar

Sl. No.	Date	Venue	No. of farmers participated	Particulars	No. of lady participants
1.	18.05.15-27.05.15	OUAT	16	Mushroom spawn production	2
2.	1.06.15-5.06.15	OUAT	16	Mushroom cultivation and processing	4
3.	25.08.15.-29.08.15	OUAT	33	Mushroom cultivation and processing	3
4.	3.11.15-7.11.15	OUAT	38	Mushroom cultivation and processing	8
5.	17.11.15-26.11.15	OUAT	23	Mushroom spawn production	3
6.	21.12.15-25.12.15	OUAT	30	Mushroom cultivation and processing	6
7.	14.03.16-18.03.16	OUAT	46	Mushroom cultivation and processing	11
Total			202		37(18%)

Table 6.4. Lecture-cum-demonstrations at Bhubaneswar

Sl. No.	Date	Venue	No. of participants	Female	Male	Composition of participants
1	10.04.15	School of Hort., Khurda	40	30	10	Trainees from all over the state
2	18.04.15	Mendhasal, Bhubaneswar	25	20	5	Farmers of Mendhasal
3	23.04.15	Barudakhana, Bhubaneswar	25	25	0	Farmers of Barudakhana
4	26.04.15	Ranpur, Nayagarh	40	0	40	Lady farmers of Ranpur
5	29.04.15	Mendhasal, Bhubaneswar	25	20	5	Farmers of Mendhasal
6	30.04.15	Barudakhana, Bhubaneswar	25	25	0	Farmers of Barudakhana
7	4.05.15	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Chhatisgarh
8	22.06.15	Jaypur-patna, Khurdha	25	25	0	Farmers of Jaypur-patna, Khurdha
9	18.07.15	Kunjari, Khurda	20	7	13	Farmers of Kunjari
10	23.07.15	CDB, Bhubaneswar	20	20	0	Farmers of Khurda
11	30.07.15	School of Hort., Khurda	25	20	5	Trainees from all over the state
12	1.08.15	ABM, Utkal University	60	40	20	Students of ABM
13	2.08.15	ABM, Utkal University	60	40	20	Students of ABM
14	4.08.15	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Satasankha, Puri
15	6.08.15	DEE, OUAT, Bhubaneswar	30	20	10	Trainees from all over the state
16	7.08.15	Jagtsinghapur	200	150	50	Farmers of Jagatsinghapur
17	25.08.15	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Puri
18	26.08.15	DEE, OUAT, Bhubaneswar	25	20	5	Agril.officers of Govt. of Odisha
19	2.09.15	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Salepur, Cuttack
20	21.09.15	KVK, Jharsuguda	25	20	5	Trainees from all over the state
21	6.10.15	Balipatna	25	15	10	Farmers of Balipatna
22	7.10.15	IMAGE, Bhubaneswar	30	30	0	Farmers of Jharkhand
23	15.10.15	Odisha livelihood Mission	40	20	20	Agril.officers of Govt. of Odisha
24	29.10.15	CDB, Bhubaneswar	25	25	0	Farmers of Begunia, Khurda
25	8.11.15	KVK, Sonapur	30	20	10	Farmers of Sonapur

Sl. No.	Date	Venue	No. of participants	Female	Male	Composition of participants
26	9.11.15	KVK, Sonapur	30	20	10	Farmers of Sonapur
27	15.11.15	PPLT Centre, Bhubaneswar	25	20	5	Farmers of Athantar, Khurda
28	21.11.15	Utkal University	60	40	20	Students of Botany
29	22.11.15	COE, Deras, Bhubaneswar	25	25	0	Farmers of Mayurbhanja
30	24.11.15	CIWA, Bhubaneswar	25	15	10	Trainees from N-E states
31	28.11.15	KVK, Sonapur	30	20	10	Farmers of Sonapur
32	29.11.15	KVK, Sonapur	30	20	10	Farmers of Sonapur
33	11.12.15	OUAT, Bhubaneswar	25	20	5	Officers of Dept. of Forest, Odisha
34	24.12.15	KVK, Keonjhar	30	25	5	Farmers of Keonjhar
35	25.12.15	KVK, Keonjhar	30	25	5	Farmers of Keonjhar
36	28.12.15	IMAGE, Bhubaneswar	60	40	20	Agril. officers of Govt. of Odisha
37	29.12.15	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Balipatna, Khurda
38	2.01.16	CA, Bhubaneswar	400	200	200	Farmers from all over the state
39	4.01.16	CTCRI, Bhubaneswar	30	10	20	Farmers of Kandhamal
40	7.01.16	CTMRT, OUAT	23	23	0	Krishak Sathis the state
41	7.01.16	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Jajpur
42	15.01.16	CRPF, Bhubaneswar	60	50	10	Employees of CRPF
43	22.01.16	Nadpur, Mayurbhanj	100	50	50	Farmers of Nadpur
44	28.01.16	COE, Deras, Bhubaneswar	60	40	20	Farmers of Mayurbhanj
45	20.02.16	Khaira, Balasore	100	0	100	Lady farmers of Khaira
46	25.02.16	Rayagada	200	150	50	Farmers of Rayagada
47	27.02.16	PPLT Centre, Bhubaneswar	25	25	0	Farmers of Khurda
48	10.03.16	KVK, Mayurbhanj	200	150	50	Farmers of Mayurbhanj
49	14.03.16	Kendrapara	400	300	100	Farmers of Kendrapara
Total	2938	2010	928 (32%)			

Table 6.5. Mass communication

Sl.No.	Item	Number
1	Participation in Krishi-exhibition	05
2	TV programme	11
3	Radio programme	03
4	Popular articles	21
5	Publication of leaflets/ booklets	02
6	Farmers-scientist interaction	12
7	Field day	02

Exposure visit of farmers

A total number of 1159 visitors comprising of farmers, Govt. functionaries and students visited the centre during 2015-16 and were apprised of the activities of the centre.

Table 6.6. Exposure visit of farmers

Sl. No.	India	No. of visitors	Share (%)
1	Odisha	850	73
2	Jharkhand	75	6
3	Bihar	20	2
4	Karnataka	48	4
5	Madhya Pradesh	56	5
6	West Bengal	54	5
7	Uttar Pradesh	34	3
8	Megalaya	16	1
Total	1159*	100*	

*The total number of visitors includes six Govt. officials from Bangladesh

Table 6.7. Composition of visitors

Sl. No.	Composition	No. of visitors	Share (%)
1.	Farmers	945	82
2.	Govt. officers	60	5
3.	Students	154	13
Total	1159	100	

*23% (266) of the total visitors were ladies

Monitoring of spawn production units

Eleven spawn production centres have been monitored during the period under report on quality of the planting materials produced and necessary addressal of problems if any.

Table 6.8. Monitoring of spawn production units

Sl. No.	Date of visit	Spawn production units
1	3.05.2015	Spawn unit at Kajipur, Khurda Spawn unit, Pahal, Khurda
2	14.08.2015	KVK, Keonjhar
3	22.08.2015	KVK, Nuapara
4	18.10.2015	KVK, Jharsuguda
5	8.11.2015	KVK, Sonapur
6	20.12.2015	Spawn unit, Tomando
7	10.03.2016	KVK, Mayurbhanj
8	26.03.2016	Spawn unit, Jagatsinghpur
9	29.03.2016	Spawn unit, Indipur, Dhenkanal

Consultancy services

- Dr. K. B. Mohapatra is working as a member of technical team of the Agriculture Consultancy Support Service Cell (ACSSC), OUAT.
- Consultancy services were extended to Socio Economic Development Association (SEDA), Cuttack for promotion of mushroom cultivation in Mahanga block of Cuttack district.
- Working as an expert (Plant Pathology) for OCTMP, Dept. of Water resources, Govt. of Odisha.
- Working as collaborative scientist for the pilot project on rice check for Odisha under IRRI-OUAT collaborative project.
- Working as member of advisory committee of Centre of Excellence, Directorate of Horticulture, Bhubaneswar.
- Advisory services were extended to large number of farmers through telephone calls / personal contacts/ e-messages throughout the year on different aspects of mushroom cultivation.

Involvement of NGOs

- Over sixty NGOs from Odisha and outside are involved in promotion of mushroom cultivation, processing and spawn production.

*Visit of dignitaries***Table 6.9.** Visit of dignitaries to Bhubaneswar centre

Date	Visitors
25.06.2015	: Agriculture specialists, Govt. of Philippines
20.07.2015	: Dr. M.P.Thakur, Director, Extension Services, IGKV, Raipur
29.10.2015	: Prof. M. Kar, Hon'ble Vice Chancellor, OUAT, Bhubaneswar
11.09.2015	: Peer Review Team of ICAR, New Delhi; Dean, College of Agriculture; DPME, OUAT, Bhubaneswar
17.01.2016	: Dean, PG-cum-DRI, Dean, College of Agriculture, OUAT and DIG, CRPF, Bhubaneswar
10.02.2016	: Dr. V.P.Sharma, Director, ICAR-DMR, Soaln, H.P.
28.03.2016	: ADG (Education), ICAR, New Delhi, Dean, College of Agriculture, OUAT, Bhubaneswar

Quality spawn supply

A quantity of 4710 packets of spawn (942kg) of Paddy straw and Oyster mushroom were distributed to the farmers @ Rs. 12/-packet* from CTMRT and AICRP on Mushroom, OUAT, Bhubaneswar with a resource generation of Rs. 49,111/-.

*The rate of spawn was hiked from Rs. 42.50/- to Rs. 60/- per kg w.e.f. 20.10.2016.

Sale proceed

An amount of Rs. 1,35,026/- has been deposited in the University towards the sale proceed of CTMRT and AICRP on Mushroom, OUAT, Bhubaneswar.

Experiential Learning Programme

Twenty numbers of final year B.Sc (Ag) students were trained in mushroom cultivation, processing and spawn production from 18.08.2015 to 16.10.2015.

Farm Advisory Services

Advisory services were extended to large number of farmers through telephone calls/ personal contacts throughout the year on different aspects of mushroom cultivation.

Farmers' achievement

- Smt Sandhyarani Mahala of Badachana, Jajpur was awarded with Biraja Samman in the District Agricultural Festival, Jajpur by Hon'ble Chief Minister, Govt. Odisha.
- Sri Sanjit Kumar Mohanty, Pipli, Puri was felicitated by Govt. of Thailand for his excellence mushroom farming.



Fig. 6.1. Training activities by Bhubaneswar Centre



Fig. 6.2. Participation in exhibitions by Bhubaneswar Centre



Fig. 6.3. Organization of field days by Bhubaneswar Centre

Pune Centre

Different extension activities were undertaken by the scientists and staff working at AICRP on Mushroom, Pune Centre in order to promote and popularize the mushroom cultivation technology in Maharashtra state during 2015-16. These activities are as follows.

Table 6.10. Extension activities of AICRPM, Pune Centre (01.04.2015 to 12.05.2016)

Activities	Number
1. Participation in Agril. Exhibition/s	03
2. Oyster and Milky Mushroom Cultivation training/s	16
3. Mass Demonstration/s	02
4. Postal queries	14
5. Queries by e-mail	118
6. Television Programme	01
7. Visitors to mushroom project (Including school/college students, farmers/mushroom growers/ research workers, teachers etc.)	2439
8. Spawn production and sale	1983.5 kg
9. Total revenue receipts generated through University funded Revolving Fund.	Rs. 2,82,650/-

Mushroom cultivation trainings

To transfer the technology of mushroom cultivation, Sixteen (16) training programmes on oyster and milky mushroom cultivation technology were conducted by the scientists of this project. Total 394 trainees were participated in these trainings.

Table 6.11. Date and number of participants in training organised by Pune centre

Sr. No.	Name of training	Date	No. of Participants
1	Oyster Mushroom Cultivation Training Programme	04.04.2015	14
2	Oyster Mushroom Cultivation Training Programme	02.05.2015	12
3	Oyster Mushroom Cultivation Training Programme	06.06.2015	16
4	Oyster Mushroom Cultivation Training Programme	04.07.2015	29
5	Oyster Mushroom Cultivation Training Programme	01.08.2015	12
6	Oyster Mushroom Cultivation Training Programme	05.09.2015	37
7	Special training on Oyster Mushroom Cultivation for Tribal Farmers of Raigad	19.09.2015	24

Sr. No.	Name of training	Date	No. of Participants
8	Oyster Mushroom Cultivation Training Programme	03.10.2015	17
9	Oyster Mushroom Cultivation Training Programme	07.11.2015	18
10	Oyster Mushroom Cultivation Training Programme	05.12.2015	22
11	Oyster Mushroom Cultivation Training Programme	02.01.2016	31
12	Oyster Mushroom Cultivation Training Programme	06.02.2016	38
13	Oyster Mushroom Cultivation Training Programme	05.03.2016	36
14	Special training on Oyster Mushroom Cultivation for Tribal Farmers of Pune district in collaboration with DMR, Solan under TSP Scheme	17-18 March 2016	30
15	Oyster Mushroom Cultivation Training Programme	02.04.2016	22
16	Oyster and Milky Mushroom Cultivation Training Programme	6-7 May 2016	36
	Total		394

Mass communication

The technology of mushroom cultivation was also transferred by sending pamphlets by post as well as by participating in exhibitions and attending farmers rallies organized by different agencies at different places.

- 1) Agril Exhibition organized by AGROWON at Hindustan Antibiotic Groun Pimpri, Pune.
- 2) KISSAN-2015 international Agril. Exhibition at Moshi, Dist– Pune.

Mass Demonstration

Two mass demonstrations cum trainings on mushroom cultivation and processing were organized by this project to popularize oyster mushroom among rural women.

- 1) Village – Chandoli, Tal- Shirala, Dist: Sangali, on 15.07.2015.
- 2) Village – Khed Shivapur, Tal- Bhore, Dist: Pune, on 18.08.2015.



Fig. 6.4. Training activities of Pune Centre



Fig. 6.5. Visit of students and dignitaries to Pune centres

Raipur Centre

Trainings

- 12 One day trainings, 5 TSP trainings (Three 3 days training and Two 4 days training), three Off campus training organized.
- Mushroom Research and training centre has been registered as VTP (Vocational training Provider) under Chief Minister Skill Development Initiative CG.
- The training was attended by 98 women and 270 men participants.

Participations

- Rashtriya Kisan mela
- Flower Show
- ICAR Western Region Kisan Mela
- Trainings sponsored by NHM, Forest Department and SAMETI
- Workshop on Mushroom conducted by CGCOST



Dr. V. P. Sharma Director DMR Solan addressing women participants at Siri Village



Dr. V. P. Sharma Director DMR Solan and Dr M. P. Thakur DES, IGKV visiting a mushroom grower in Puri village CG



Closing ceremony of 4 days training at Mohda Gariyaband



Distribution of Cooker, Inoculation Chamber, Drums, Spawn at Mohda Gariyaband



Off campus training programme



Spawn training to students



Training of Women Self help groups and students at IGKV



Women self help group at Gariyaband



Low cost design of Inoculation chamber (Cost Rs. 500)



Mushroom grower at Kanker



Training on Button Mushroom Production for Chhattisgarh Hill Zone



Training at Kokpur village Kanker

Fig. 6.6. Some photographs of Training activities by Raipur Centre



Fig. 6.7. Field Days on Oyster and Paddy straw mushroom

Revenue generation

Raipur, IGKV

Total Planting spawn sold	29.56 Quintals
Mother spawn sold	163 Bottles
Pure culture tube sold	38 Tubes
Fresh Mushroom	153 Kg

Jagdalpur, IGKV

Total Planting spawn sold	738 kg
Fresh Mushroom	265.75Kg

Bijapur IGKV

Total Planting spawn sold 317 kg

Janjgir Champa IGKV

Total Planting spawn sold 135 kg Spawn

Bilaspur

Total Planting spawn sold 184 kg spawn

Facility created



Fig. 6.8. Training centre and museum at IGKV, Raipur



Fig. 6.9. Spawn lab at Bijapur

Student visited

Table 6.12. Visit of student to Mushroom Lab IGKV

1.	Students visit of Girls Degree college Raipur	86	1 Day	Organized by Respective School/College Administration
2.	Girls of Rehabilitation center Govt of CG Raipur	19	1 day	Organized by Respective School /College Administration
3.	Columbia Institute of Technology	68	1 day	Organized by Respective School/ College Administration
4.	National Institute of Technology, Raipur	59	1 day	Organized by Respective School/ College Administration
5.	Government Science College Raipur	45	1 day	Organized by Respective School/ College Administration
6.	Science College, Rajim	10	1 day	Organized by Respective School/ College Administration

Table 6.13. Students Training on mushroom and spawn production technology through experiential learning and Rural Agricultural Work Experience (RAWE).

Activity	Programme	Student No
Mushroom production technology and their diseases and pests control	RAWE/ Experiential Learning	79
Commercial Mushroom Cultivation ACPT-425 (0+2)	B.Sc. Ag IV Year	

Nauni Centre

1. Delivered 18 lectures on “Mushroom cultivation” to farmers in different training programmes.
2. Delivered **TV talk** on “Mushroom ki kheti” on 13/10/15 in **DD Kisan Channel** for “Khet Khaliyan Programme

3. Delivered **TV talk** on “Rishi Mushroom ki Kheti” on 12/09/15 in “Anndata programme” for the TV Channel “**ETV- Haryana and Himachal**”
4. Delivered **TV talk** on “Button khumb ke liye khad taiyar karne ki vidhi” for Krishi Darshan programme of **DDK, Shimla** on 3/2/16.
5. Participated in Mushroom mela at DMR, Chambaghat, Solan on 10th Sep. 2015
6. Attended the Kisan Mela on 3/4/16 at KVK, Kandaghat



Fig. 6.10. Training Programmes organized by Nauni centre

Distinguished visitors

1. Sh.Deepak Kumar, Secretary, Information technology, Science & Technology, Human Rights commission, Uttarakhand visited Mushroom Centre on 25/12/15.
2. B.Sc.(Agr.) students of Sarn Higginbottom Institute of Agriculture, Technology and Science, Allahabad visited Mushroom Centre on 6/10/15.

Spawn Sale

Quality Planting spwn 4.7 tons

Experiential Learning Programme in Mushroom

Sixteen numbers of B.Sc. (Hort.) final year students (14 girls and 2 boys) were imparted one year “Experiential Learning Programme in Mushroom”.

Murthal*Trainings*

Particulars	2015-16 (April to March 2016)
Number of Trainings	20
Number of Trainees	834

Table 6.14. Detail of Trainees for the year 2015-16

Sr. no.	Name of Programme	Duration	SC	BC	BCB	OBC	GEN	MEN	WOMEN	Total
1	Mushroom Production Technology	04/08/2015 to 07/08/2015	0	2	0	1	29	27	5	32
2	Mushroom Production Technology	11/08/2015 to 14/08/2015	10	11	0	1	8	22	8	30
3	Mushroom Production Technology	25/08/2015 to 28/08/2015	3	7	0	0	23	29	4	33
4	Mushroom Production Technology	16/09/2015 to 19/09/2015	1	8	0	3	19	31	0	31
5	Mushroom Production Technology	23/09/2015 to 26/09/2015	2	2	0	1	22	27	0	27
6	Mushroom Production Technology	07/10/2015 to 10/10/2015	4	8	0	3	31	46	0	46
7	Mushroom Production Technology	21/10/2015 to 24/10/2015	7	23	0	0	23	1	52	53
8	Mushroom Production Technology	28/10/2015 to 31/10/2015	7	0	0	0	17	24	0	24
9	Mushroom Production Technology	18/11/2015 to 21/11/2015	13	4	0	0	16	33	0	33
10	Mushroom Production Technology	18/11/2015 to 21/11/2015	13	8	0	2	14	37	0	37
11	Mushroom Production Technology	09/12/2015 to 12/12/2015	11	14	0	0	34	59	0	59
12	Mushroom Production Technology	23/12/2015 to 26/12/2015	8	0	0	5	19	31	1	32
13	Mushroom Production Technology	23/12/2015 to 26/12/2015	6	0	0	7	16	29	0	29
14	Mushroom Production Technology	06/01/2016 to 09/01/2016	8	0	0	10	32	49	1	50
15	Mushroom Production Technology	13/01/2016 to 16/01/2016	9	0	0	10	23	42	0	42
16	Mushroom Production Technology	27/01/2016 to 30/01/2016	12	9	0	0	27	45	3	48
17	Mushroom Production Technology	03/02/2016 to 06/02/2016	9	5	0	2	27	43	0	43
18	Mushroom Production Technology	02/03/2016 to 05/03/2016	10	5	6	0	44	61	4	65
19	Mushroom Production Technology	09/03/2016 to 12/03/2016	4	3	4	13	17	40	1	41
20	Mushroom Production Technology	28/03/2016 to 31/03/2016	6	11	3	4	55	79	0	79
Total	143		143	120	13	62	496	755	79	834

Mushroom Spawn Production and Sale

Production (kg)	79154
Sale (kg)	73342

Production and Sale of Mushroom

Production (kg)	3679.79
Sale (kg)	3499.19

Advisory and Compost Testing

Number of Farmers Advisory services	154
Compost samples tested	116

Production and Sale of Pasteurized Compost

Production (kg)	578646
Sale (kg)	578646

Mushroom Pickle Production and Sale

Production (kg)	142.25
Sale (kg.)	142.25

Production and Sale of Casing Soil

Production (kg)	45838
Sale (kg)	45838

Participation in Fairs

- Participation in National Mushroom Mela held at Solan
- Participated in Unnat Krishi Mela held at New Delhi.
- Participated in World Culture Festival held at Yamuna river ved, New Delhi.
- Participated in Geeta Jayanti Festival held at Sonapat.
- Participated in Krishi Mela held at KVK Panipat.



Participation in National Mushroom mela



Ambassador of Nepal



Asstt. Commissioner of Horticulture, GOI



Nigerian Nationals



Joint Secretary MIDH, Govt. of India



Executive Director, HAIC R&D

Additional Chief Secretary, Agriculture,
Haryana

Official from Punjab Govt.



Principal Secy. To CM Haryana

Fig. 6.11. Visit of dignitaries at HAIC Murthal



Fig. 6.12. Some photographs of training at HAIC, Murthal

Pusa Centre

During 2015-16 period a total of 3860 kg spawn was sold and increased 190 kg as compared to last year (3670 kg). The revenue of Rs. 347400.00 was generated by mushroom spawn. Altogether 1742 bottles of mother spawn (each 350 g) was supplied all over Bihar.

Table 6.15. Spawn sold during 2015-16

Sl. No.	Spawn sale by Pusa Centre	2015-16
1.	Spawn sold	3860 kg
2.	Mother spawn sold	610 kg
Spawn sold by spawn producers		
1.	Ravindra Kumar Ravi, Samastipur	600 kg
2.	Manorma Singh, Vaishali	710 kg
3.	Mohan Pd. Kesari, Jamui	1480 kg
4.	Surya Deo Mehta, Gaya	1660 kg
5.	Anita Kumari, Nalanda	1800 kg

Table 6.16. One day training programme Off Campus

Sl. No.	Date	Venue	No. of participants		Total	Adoption	Sponsor
			Male	Female			
1.	12.07.2015	Kalikapur, Supaul	19	53	72	25	TSP
2.	02.08.2015	Morsand, Malpur, Samastipur	0	43	43	50	AICRP
3.	12.08.2015	RAU, Pusa	107	113	220	50	AICRP
4.	06.08.2015	Muzaffarpur	16	37	53	25	AICRP
5.	06.09.2015	Panchmania, Madhubani	74	83	157	120	TSP
6.	27.09.2015	Ghosaut, Muzaffarpur	14	38	52	32	AICRP
7.	27.09.2015	Madhuaha, East Champaran	-	30	30	35	AICRP
8.	27.09.2015	Maniarpur, East Champaran.	-	15	15	25	AICRP
9.	04.11.2015	Bihta, Patna	23	-	23	35	AICRP
10.	06.11.2015	Panchwania, Madhubani	-	60	60	60	TSP
11.	23.11.2015	Gaighat, Muzaffarpur	17	-	17	25	AICRP
12.	24.12.2015	Mahendwara, Sitamarghi	513	540	1053	45	AICRP
13.	03.01.2016	Barari, Sitamarhi	36	37	73	47	AICRP
14.	10.01.2016	Panch lal, Darbhanga	-	45	45	30	AICRP
15.	05.02.2016	Koilak, Madhubani	50	-	50	54	AICRP
16.	06.02.2016	Bajpatti, Sitamarhi	-	430	430	65	AICRP
17.	14.02.2016	RAU Pusa	20	-	20	35	AICRP
18.	25.02.2016	RAU Pusa	8	54	62	65	AICRP
19.	12.03.2016	RAU Pusa	-	50	50	45	ATMAMuz.

Table 6.17. On campus detailed Training programme

Sl. No.	Date	Venue	No. of participants		Total	Adoption	Sponsor
			Male	Female			
1.	10 - 12.09.2015	RAU, Pusa	53	2	55	70	AICRP
2.	21 - 27.01.2016	RAU, Pusa	09	23	32	210	TSP
3.	08 -14.02.16	RAU, Pusa	18	6	24	40	AICRP
4.	05- 07.03.16	RAU, Pusa	40	180	220	300	ATMA, Sitamarhi
5.	09- 10.03.16	RAU, Pusa	06	26	32	210	TSP

Table 6.18. Kisan Gosthi organized

Sl. No.	Date	Venue	No. of participants		Total	Sponsor
			Male	Female		
1.	01.05.2015	Mohanpur, Samastipur	122	7	129	AICRP
2.	22.12.2015	Panchwania, Madhubani	92	120	212	TSP
3.	24.12.2015	Runni Saidpur, Sitamarhi	600	350	950	ATMA, Sitamrhi
4.	17.01.2016	Majorganj, Sitamarhi	-	456	456	ATMA, Sitamrhi
5.	06.02.2016	Bajpatti, Sitamarhi	102	453	555	ATMA, Sitamrhi
6.	13.02.2016	Lalganj, Vaishali	112	260	372	AICRP

Kisan Mela

1. Participated in Kisan Mela at RAU, Pusa from March, 5-7, 2016
2. Exposure visit of 400 female under AICRP was done. Out of this 52 tribals from Panchwania village of Madhubani district on 5.3.2016 to 7.3.2016.
3. Progressive farmers from Patna, Nalanda, Banka, Gaya, Jamui, Samastipur, East Champaran, West Champaran, Muzaffarpur, Kaimur, Saran, Madhubani (Tribal), Sheohar, Darbhanga, Begusarai wer put their stall in Mushroom Hub.
4. Mushroom Hub got 1st Prize in Kisan Mela, 2016.

TV Talk

- 07.09.2015 – ETV Bihar
- 25.12.2015 – DD Bihar
- 26.12.2015 – ETV Bihar
- 18.01.2016 – DD Bihar
- 06.02.2016 – DDNews

Mushroom Booklet

Mushroom Utpadan Takneek in Tribal language was released by Hon'ble Agricultural Minister on 5th March, 2016 during inaugural function of Kisan Mela, 2016.

Award

1. 1st Prize for Mushroom Jhanki on Republic Day Parade at RAU, Pusa.
2. 1st Prize for Mushroom Hub in Kisan Mela at RAU, Pusa

Participation in Seminar/Kisan Mela

1. Participated in 3 days state level seminar on "Modern Technique of mushroom production as resource person from Dec. 2-4, 2015 held at Rajgir, Nalanda, Bihar.
2. Participated in State Level Kisan Mela organized by RAU, Pusa.

Tribal sub plan

Table 6.19. Off Campus training programme to tribal's

Sl. No.	Date	Venue	No. of participants		Total	Adoption	Sponsor
			Male	Female			
1.	12.7.2015	Kalikapur, Supaul	19	53	73	25	Oyster Mushroom
2.	06.09.2015	Panchmani, Madhubani	74	83	157	210	Oyster Mushroom
3.	06.11.2015	Panchmani, Madhubani	-	60	60	120	Button Mushroom

Table 6.20. On campus detailed training

Sl. No.	Date	Venue	No. of participants		Total	Adoption	Sponsor
			Male	Female			
1.	21 to 27.01.2016	RAU, Pusa	9	23	32	210	TSP
2.	09 to 10.03.2016	RAU, Pusa	6	26	32	240	TSP

Table 6.21. Kisan Gosthi Organized.

Sl. No.	Date	Venue	No. of participants		Total	Adoption	Sponsor
			Male	Female			
1.	22-12-15	Panchwania	92	120	212	210	TSP, DMR SOLAN

Inputs supplied to tribal

1. 60 oyster bags (2 kg each), 60 kg oyster spawn and 60 kg dudhia spawn was distributed to 60 tribal women on 06. 09 . 2015. Result indicated that 2.5 kg to 5kg oyster and 1.5 to 3kg Dudhia mushroom was harvested after 30 day and 45 days respectively.
2. 100kg button compost and 700g button spawn to each tribal women (60 women) was distributed on 06-11-2015. They prepared 20 bag from 100kg compost. Again 100kg compost and 700g spawn was distributed on 22-12-15. Result indicated that 22kg to 35 kg button mushroom was harvested by them
3. They are using mushroom in their diet from Oct. 2015. Some of them sold mushroom and earned Rs 2000 to 6000 up to Feb. 2016.

Participation in Kisan Mela

1. Thirty two tribal participated in Republic Day celebration March Past & Jhanki on 26.01.2016 and bagged 1st Prize.
2. Fifty two tribal women participated in Kisan Mela organized by RAU, Pusa from 05.03.2016 to 07.03.2016 and put one mushroom stall in Mushroom Hub.

Mass Communication

- ETV Bihar द्वारा 06-09-2015 का प्रोग्राम 07-09-2015 को प्रसार ।

Newspaper Clips

1. Mushroom farming to save youth from rebels. The Telegraph. 13 April, 2015 (P-08).
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3. मशरूम से मजबूत होता प्रतिरोधी तंत्र। हिन्दुस्तान, 19 अप्रैल, 2015 (पेज-01)
4. बिहार अपना इतिहास बना रहा है कृषि के क्षेत्र में : वी.सी। दैनिक जागरण 3 मई 2015 (पेज-08)
5. कुलपति ने बताये उपज बढ़ाने के तरीके। हिन्दुस्तान, 3 मई 2015 (पेज-08)
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9. बदलते मौसम में किसान लगा सकते हैं राजेन्द्र दूधिया मशरूम। प्रभात खबर 17 जून 2015 (पेज-06)
10. सूखा मशरूम उत्पादकों के लिए बेहतर विकल्प। प्रभात खबर 09 जुलाई 2015 (पेज-08)
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12. मशरूम स्पेन्ट एक उत्तम कोटि की खाद। प्रभात खबर 14 जुलाई 2015 (पेज-06)
13. मशरूम की खेती करेंगे किसान। हिन्दुस्तान, 15 जुलाई 2015 (पेज-05)
14. अनीता को पी0एम0 करेंगे पुरस्कृत। हिन्दुस्तान, 20 जुलाई 2015 (पेज-11)
15. मशरूम की खेती ने बदली मनोरमा की तकदीर। दैनिक जागरण 29 जुलाई, 2015 (पेज-03)
16. महिलाएं भी अपना रही हैं कृषि व पशुपालन। हिन्दुस्तान, 29 जुलाई 2015 (पेज-03)
17. मशरूम के उत्पादन से सशक्त होगी प्रखंड क्षेत्र की महिलाएं। प्रभात खबर 03 अगस्त, 2015 (पेज-04)
18. राजेन्द्र दुधिया मशरूम बटन से ज्यादा प्रचलित। प्रभात खबर 23 अगस्त, 2015 (पेज-06)
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21. मशरूम की खेती का मिला प्रशिक्षण। प्रभात खबर 23 अगस्त, 2015 (पेज-06)
22. आर्थिक मजबूती के लिए करें मशरूम की खेती। हिन्दुस्तान, 7 सितम्बर, 2015 (पेज-07)
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Fig. 6.13. Extension activities of Pusa centre

Ludhiana Centre

Trainings organized

Table 6.22. Training, lectures, exhibitions, visits, TV/Radio talks organized by Ludhiana Centre

Date	Venue	No. of participants
19-20.05.15	Training course on cultivation and processing of tropical mushrooms, PAU, Ludhiana.	55
26.05.15	Training course on cultivation of milky mushroom, KVK, Bathinda	15
18-22.06.15	Mushroom training for Horticuture Supervisor Trainees, PAU, Ludhiana.	24
26.08.15	Training course on cultivation of mushrooms, KVK, Bahawal	20
07-11.09.15	Mushroom training course for rural farmers, PAU, Ludhiana.	52
05-09.10.15	Mushroom training course for rural farmers, PAU, Ludhiana.	48
30.09.15	Training course on cultivation of mushrooms, KVK, Bathinda	28
08-10.10.15	Mushroom training course for rural farmers at Village Ratta Khera	48
19.10.15	Training course on cultivation of mushrooms, KVK, Sangrur	20
04.11.15	Training course on cultivation of mushrooms for ADO,s at PAMETI, Ludhiana	16
05.11.15	Training on cultivation and post harvest of mushrooms for farmers of Kangra	20
04.12.15	Training course on cultivation of mushrooms, KVK, Bathinda	10
11-12.12.15	Induction training on mushroom for field staff of SAMC, PAU, Ludhiana	100
08.01.2016	Training course on cultivation of mushrooms, KVK, Ropar	08
10.03.16	Training course on cultivation of mushrooms, KVK, Mansa	32
16.03.16	Training course on cultivation of mushrooms, KVK, Rauni	30
29.03.16	Training course on cultivation of mushrooms, village Boparai	28
Exhibitions/Lectures		
25.05.15	Exhibition at FSS, PAU, Ludhiana for farmers interaction	
20.07.15	Lecture cum exhibition at PAU kisan committee and PAU fruit and vegetable growers committee at Pal Auditorium, PAU, Ludhiana	
06.08.15	Lecture on medicinal mushrooms at monthly training camp of PAU kisan club, Pal Auditorium, PAU, Ludhiana	
27.08.15	Exhibition at Research and Extension Specialists workshop on Rabi crops	
15.09.15	Regional Kisan Mela at KVK, Amritsar	
15.09.15	Regional Kisan Mela at Ballawal	
15.09.15	Regional Kisan Mela at Faridkot	
18.09.15	Regional Kisan Mela at Rauni	
25-26.09.15	Kisan Mela at PAU, Ludhiana	
28.09.15	Regional Kisan Mela at Bathinda	
30.09.15	Regional Kisan Mela at Gurdaspur	
16.10.15	Exhibition at PAU Convocation with UGC Chairman as chief guest	
21-23.11.15	India International Trade Fair (14-27 Nov.), N. Delhi	
20-21.01.16	Exhibition at Research and extension specialist workshop on vegetable, floriculture, sericulture, post harvest management, FPM, FT and Agril economics, PAU, Ludhiana	

Date	Venue	No. of participants
04.02.2016	Exhibition at the Annual Kisan Club Meet, Pal Auditorium, PAU, Ludhiana	
23-24.02.16	Exhibition at Research and extension specialist workshop on kharif crops, PAU, Ludhiana	
04.03.16	Regional Kisan Mela at Ballawal	
04.03.16	Regional Kisan Mela at KVK, Amritsar	
06.03.16	Exhibition on visit of Sh Shiv Raj Singh Chauhan, CM, MP	
09.03.16	Regional Kisan Mela at Faridkot	
11.03.16	Regional Kisan Mela at Rauni	
15.03.16	Regional Kisan Mela at Gurdaspur	
18-19.03.15	Kisan Mela at PAU, Ludhiana	
22.03.15	Regional Kisan Mela at Bathinda	
Visits		
18.06.15	Visit of Mushroom Research Center, PAU by students and faculty of College of Agriculture, Central Agril. Univ., Imphal, Manipur	25B, 25G, 2 faculty
24.06.15	Visit of Mushroom Research Center, PAU by farmers and farm women from Punjab organized by PAMET, PAU, Ludhiana	27
13.08.15	Visit of Mushroom Research Center, PAU by farmers from Palakkad, Kerala	30
10.09.15	Visit of Mushroom Research Center, PAU by farmers from KVK, Fazilka	30
10.09.15	Visit of Mushroom Research Center, PAU by VIDISHA farmers from MP	15
11.09.15	Visit of Mushroom Research Center, PAU by farmers from KVK, Samrala	20
21.09.15	Visit of DMR, Solan	-
30.09.15	Visit of Mushroom Research Center, PAU by farmers from KVK, Bathinda	28
03.10.15	Visit of Mushroom Research Center, PAU by students and faculty from Agri. College, UAS, Raichur, KA	16G,25B, 2 faculty
08.10.15	Visit of Mushroom Research Center, PAU by farmers from Karnatka	50
28.10.15	Visit of Mushroom Research Center, PAU by farmers from DDA (ext.) Zila Parishad, Rajasthan	35
30.10.15	Visit of Mushroom Research Center, PAU by farmers from West Bangal	16
06.11.15	Visit of Mushroom Research Center, PAU by students from College of Horticulture, Hiriur, KA	21G,18B, 3 faculty
30.11.15	Visit of Mushroom Research Center, PAU by students from College of Agriculture, VASO campus, Distt. Kheda, Gujrat	21G,18B, 2 faculty
02.12.15	Visit of Mushroom Research Center, PAU by students from College of Agriculture, Anand Agril. Univ., Anand, Gujrat	32G,115B, faculty
04.12.15	Visit of Mushroom Research Center, PAU by farmers from KVK, Bathinda	10
09.12.15	Visit of Mushroom Research Center, PAU by students from College of Agriculture, UAS, Mandya, Bengaluru, KA	18G,19B, 3 faculty
10.12.15	Visit of Mushroom Research Center, PAU by students from College of Agriculture, GKVK, Bengaluru, KA	19G,21B, 3 faculty
17.12.15	Visit of Mushroom Research Center, PAU by students from College of Agriculture, UAS, Mandya, Bengaluru, KA	12G,26B, 2 faculty
29.12.15	Visit of Mushroom Research Center, PAU by students from SVM Public School, Ludhiana	55
16.01.16	Visit of Mushroom Research Center, PAU by ICAR team along with DEE, PAU.	-

Date	Venue	No. of participants
18.01.16	Visit of Mushroom Research Center, PAU by students from College of Horticulture, Mysuru, UHS, Bagalkot, KA	23G,23B, 3 faculty
18.01.16	Visit of Mushroom Research Center, PAU by students from Govt. High School, Rajo Majra, Sangrur	20B, 3 faculty
05.02.16	Visit of Mushroom Research Center, PAU by students from KRC College of Horticulture, 35G,29B,2 faculty	
20.02.16	Visit of Mushroom Research Center, PAU by students from College of Horticulture, Bidar, UHS, Bagalkot, KA	30G,42B, 3 faculty
22.02.16	Visit of Mushroom Research Center, PAU by students from College of Horticulture, SDAU, SK Nagar, Dantiwada, Gujrat	11G,25B, 3 faculty
24.02.16	Visit of Mushroom Research Center, PAU by the Delegation from Ministry of Agriculture, Nepal	-
Seminar/Workshop		
29-30.05.15	Research and extension specialist workshop on vegetable, floriculture, sericulture, post harvest management, FPM, FT and Agril economics, PAU, Ludhiana	
29-30.06.15	XVIIth Annual Workshop of AICRP on mushrooms at DMR, Solan	
20-21.01.16	Research and extension specialist workshop on vegetable, floriculture, sericulture, post harvest management, FPM, FT and Agril economics, PAU, Ludhiana	
26.02.16	State level Mushroom Meeting chaired by Dr Manjit Singh, Mushroom Advisor, Punjab Govt.	
TV/Radio Talk/News Column		
01.09.15	Khumban di kasht, DDK, Jalandhar	
02.09.15	Khumban di kasht, AIR, Jalandhar	
04.09.15	Khumban di kasht, DDK, Jalandhar (recording)	
06.10.15	Vadhia Khumb utpadan dian taknikaan, AIR, Jalandhar	

Spawn supply

During the year 2015-16, 1180 kg mushroom spawn of *Agaricus bisporus*, *Calocybe indica*, *Pleurotus* spp. and *Volvariella volvacea* was supplied to the mushroom growers of Punjab.



Fig. 6.14. Mushroom cultivation training at Ludhiana Centre



Fig. 6.15. Kisan Mela Stall of Ludhiana Centre

Barapani Centre

Seven trainings and five demonstrations were conducted on mushroom cultivation which included farmers, entrepreneurs etc. Trainings were oriented towards spawn production, mushroom cultivation and postharvest management. Spawn was also provided to KVK's, University etc.

Table 6.23. Trainings, demonstrations and revenue generation of Barapani Centre

S. No.	Activity	Date	Duration	No. of Participants
1.	Mushroom cultivation and spawn production	11.05.15-15.05.15	5 days	10 (Male: 6; F: 4)
2.	Mushroom cultivation and spawn production (MGMG, TSP)	29.10.15 to 2.11.15	5 days	11 (Male: 5; F: 6)
3.	Mushroom cultivation and spawn production	02.02.16 – 06.02.16	5 days	24 (Male :12 ; F: 12)
4.	Oyster Mushroom cultivation	15.07.15	One day	15 (Male: 6; F: 9)
5.	Oyster Mushroom cultivation	12.08.15	One day	20 (Male: 8; F: 12)
6.	Oyster Mushroom cultivation	21.01.16	One day	47
7.	Oyster Mushroom cultivation	16.03.16	One day	24
S. No.	Activity	Date	No. of Participants	
b. Demonstrations				
1.	Oyster Mushroom cultivation	03.03.16	150	
2.	Oyster Mushroom cultivation	29.03.16	13 (Male: 11, F: 2)	
3.	Shiitake cultivation	20.02.16	F: 11, M:2	
4.	Shiitake cultivation	30.3.16	10	
5.	Oyster Mushroom cultivation	4.03.16	16 (M:6, F:10)	
S. No.	Commodity	Quantity	Amount (Rs.)	
c. Revenue generation				
1.	Spawn sale	777.2 kg	69232/-	
2.	Mother spawn	57.6 kg	8556/-	
3.	Fresh Mushroom	220.8 kg	13303/-	
4.	Culture tubes	28 nos.	12500/-	
		Total	1,03,591/-	



Fig. 6.16. Training activities at Barapani Centre

IIHR Bangalore centre

Quality spawn production

36493 Kg (36.493 tons) of spawn was sold to the farmers

Extension & training

- 92 people were trained on mushroom cultivation and spawn production at IIHR campus.
- Off campus trainings were conducted at Directorate of Horticulture (Biocentre), Hulimavu, Bengaluru, Department Of Horticulture Government Of Karnataka, Oct and Dec 2015 and at NGO, creative Green lifestyles Bengaluru in April & May 2015.

International training –UNESCO-UNEVOC

Transfer of technology through invited lecture was done at TVET Green program of UNEVOC with the SAARC & ASEAN countries in the area of entrepreneurship development in Agricultural Biotechnology held at Vivekananda Institute of Biotechnology, Nimpith, Kolkatta from 29th Nov to 5th Dec 2015.

Women empowerment

2949 Ready to fruit (RTF) bags were sold to rural and urban women to grow mushrooms at home as kitchen garden activity to enhance nutrition of daily diet.

Revenue generation

Revenue of Rs. 2504371 was generated by the mushroom lab from April 2015 to March 2016.

BCKV Kalyani Centre

Training Programme Organized

A mushroom training was imparted at Agricultural Training Centre, Kalyani to women from various districts. A total of 23 interested enthusiastic women farmers participated in this training event. We received very positive feedback from involved people.





Fig. 6.17. Extension activities at BCKV, Kalyani (WB)

Teaching and Outreach Programmes

- ❖ UG – IV year BSc.,(Agri.) students were taught PPI 451 . Experiential Learning in Mushroom Production Technology 0+2 Course during VIII Semester 2014-15(RAWE program)
- ❖ PG – One MSc., (Ag.) Plant Pathology student has been allotted work on *Pleurotus* mushroom.

Manipur Centre

Table 6.24. On-campus and Off-campus training programmes

Sl. No.	Date	Venue	No. of participants	Particulars	No. of lady participants
1	7 September, 2015	ICAR Manipur Centre	8	Pleurotus Mushroom Cultivation	3
2	8 October, 2015	ICAR Manipur Centre	12	Cultivation of Pleurotus Mushroom	4
3	16-17 October, 2015	Khajiri, Mamang Leikai, Nambol, Imphal West district	29	Cultivation of Pleurotus mushroom	23
4	27 November to 3 December, 2016	ICAR, Manipur Centre	40	Compost preparation and cultivation of button mushroom	32
5	2-4 December, 2015	ICAR, Manipur Centre	3	Mushroom spawn production	2
6	21-23 December, 2015	ICAR, Manipur Centre	34	Spawn Production and Cultivation of Pleurotus Mushroom	20
7	5-6 January, 2016	Kachai village, Ukhrul district	42	Cultivation of Pleurotus Mushroom	35
8	11-12 January, 2016	Chandanpokpi village, Chandel district.	41	Cultivation of Pleurotus Mushroom	17
9	27-28 January, 2016	TBC Tamenglong district headquarter	61	Cultivation of Pleurotus Mushroom	40
10	22-23 February, 2016	Khriziphi village, Mao Maram, Tadubi block, Senapati district	33	Pleurotus Mushroom Cultivation	25
11	15-17 March, 2016	ICAR, Manipur Centre	29	Scientific Mushroom Cultivation	20
12	17-19 March, 2016	ICAR, Manipur Centre	44	Scientific Mushroom Cultivation	32
Total			376		253 (67.28%)

Demonstration at farmer's field

A Demonstration on Oyster Mushroom Production at Chandanpokpi village, Chandel, district.

Field Days

Three field days were organized

Lectures

1. Lecture on "Integration of Mushroom Cultivation in IFS" for the participants of ICAR sponsored Short Course on "Integrated Farming System: An Approach Towards Livelihood Security and Natural Resource Conservation" on 17 September, 2015 at ICAR, Manipur Centre
2. Practical demonstration on "Mushroom and Spawn Production" for the participants of ICAR sponsored Short Course on "Integrated Farming System: An Approach Towards Livelihood Security and Natural Resource Conservation" on 18 September, 2015 at ICAR, Manipur Centre

Farmer Scientist Interactions: 12

Consultancy Services

Consultancy services on various aspects of spawn production, mushroom cultivation, pests and disease management and post-harvest processing were provided to (i) Integrated Mushroom Association, (ii) M/s Pureiromba Enterprises, Imphal East, (iii) RNBA, Imphal West, (iv) Rama Foundation, Imphal West, (v) Universal Mushroom Club, Imphal West, (vi) NupiTengbangLup, Imphal West, (vii) M/s Sana Leibak Mushroom Farm, Imphal West, (viii) The Sarah's Self Help Group, Imphal West.

Experiential learning programme

Three days session on "Mushroom Cultivation: Theory and Practical" for RAWE students during 16-18, February, 2016 at ICAR, Manipur Centre

Farmers Achievement

Mr. Sh. Ibohal Sharma a resident of Thangmeiband Thingel Leikai, Imphal West, who is trained in spawn production and mushroom cultivation by ICAR Research Complex for NEH Region, Manipur Centre bagged 'Best Farmer Award' in 1st Manipur National Horti Expo organized by Department of Horticulture and Soil Conservation, Govt. of Manipur in collaboration during 11-13 June, 2015.

Spawn Production and Supply

During the year quality spawn was produced and supplied to different stakeholders. A total of 1530 number of spawn packets of *Pleurotus* (each packet of 600 gm) and shitake mushrooms (each packet of 600 gm) were produced.

Visit of dignitaries

- Dr. A.K. Sharma, Director, ICAR-NBAIM, MAU (UP) on 5th June 2015
- Dr. K.R. Dhiman, Ex VC YSPUHF, Nauni Solan, H.P on 13th June 2015
- Dr. K. K. Katoch. VC, CSKHPKV, Palampur, H.P. during 4-6, March, 2016
- Dr. A. Pattanayak, Director, ICAR- VPKAS, Almora during 4-6, March, 2016



Fig. 6.17. Extension activities by Manipur Centre

Meerut Centre

Training

Two trainings were conducted in month of October 2015 for women at Mushroom laboratory in SVPUA&T, Meerut and in July 2015 for military soldiers in Cantment office of Meerut in which 20 no. of participants were present.

Field Days

One field day on Mushroom production in Military Cantt Meerut was organised, which was chaired by Commanding Officer of Meerut Cantt.

Mushroom Museum

Place for Mushroom Museum in the University has been decided by Director Research/Hon'Vice-chancellor.

Experiential learning

09 undergraduate students participated in experiential learning programme on Mushroom production technology during IIInd Semester 2015-16

Resource Generation Activity (2015-16)

Mushroom sold / Produced	180 kg
Commercial Mushroom spawn sold / Produced	100 kg
Mushroom Culture Tube	13
Number of Spawn Purchaser	21
Visitors (farmers) of Mushroom Lab	72
Advisory Service to Mushroom Growers	10

Ph.D. students guided (2015-16): 02

Name	Id.	Year	Thesis Title
Ashutosh Kumar Srivastva	1988	2015	Studies on spawn quality of milky mushroom
Brajesh Kumar	2151	2015	Studies on morphological variability and interspecific hybridization of oyster mushroom

M.Sc (Ag) students guided (2015-16): 05

Name	Id.	Year	Thesis Title
Kaushal Kumar	2564	2015	Studies on production technology of milky mushroom
Satpal Singh	2560	2015	Studies on production technology of oyster mushroom

TV Talk

Date	Place	Organiser	Topic
01..09.15	Delhi	DD Kisan Channel	Mushroom farming (Hello Kisan)

Invited Lectures on Mushroom Production in Kisan Gosthi/Divas (2015-16)

Date	Place	Organiser
22.01.16	Bulandsahar	IIFCO
08.09.15	Sahajahapur	KVK
09.09.15	Badaun	KVK
09.02.16	Meerut	State Agriculture Department
24.02.16	Meerut	Directorate of Extension
06.11.15	Meerut	State Agriculture Department



Fig. 6.18. Extension activities at Meerut Centre

Nagaland Centre

Training and demonstration

Hands on training on “Mushroom Cultivation: An alternate option for entrepreneurship development” conducted for the farmers on 27th February, 2016 at Thekrejuma village, Kohima dist. The training cum demonstration was organized by focusing on mushroom with respect to nutritional importance, daily demand for mushroom and the economics of cultivation in Nagaland. Practically demonstrated the different steps involved in oyster mushroom cultivation for the farmers and marketing of mushroom. All together 16 woman farmers from the village were attended. Inputs like mushroom spawn and polythene bags were distributed for the farmers to continue the practice mushroom cultivation in the village.



Fig. 6.19. Training programmes organized by Nagaland Centre

Under 3 days training programme on “Avenues for Entrepreneurship Development in Agri-Horti Ecosystem for Farmers and Rural Youth” delivered a lecture on “Commercial cultivation of mushroom for additional income” and also practical demonstrated on mushroom cultivation for the farmers of Nagaland. All together 25 farmers and rural youth from Longleng, Wokha, Kohima and Dimapur districts of Nagaland were participated.

Mushroom based IFS model

In our research farm, an integrated farming system (Model No.4: Agriculture + Mushroom + Horticulture + Fishery + Poultry) has been developed including mushroom as a one of the component. The paddy straw from the agriculture component used as a raw material for the cultivation of mushroom as a waste utilization. We have been demonstrating mushroom based integrated farming system as and when interested farmers during the exposure visit.



Fig. 6.20. Farm model visit by farmers of Assam during their exposure trip

Spawn and mushroom production

The spawn packets have been producing in the ICAR Research Complex for NEH Region, Nagaland centre, Jharnapani to supply for the farmers of the Nagaland and other states to fulfil the demand and increase the promotion of the mushroom in Nagaland state. A total of 1182 kg of spawn was produced during 2015-16.

Palampur Centre

Trainings

Since, October 2015 from the date of implementation of the project two off-campus training camps was organised on 06.11.2015 and 07.11.15 at village Rit in Khaira block of district Kangra, in which 15 women participated and the other in village Lambagaon where 33 womens participated. During the camp



Fig. 6.21. Training programmes organized by Palampur centre

lectures were delivered on button mushroom and Dhingri cultivation, the farmers were made aware about the importance of mushrooms, medicinal value and practical on cultivation of dhingri. The participants were demonstrated practically how to prepare the substrate, spawning, filling of pp bags and up keep of Dhingri bags for spawn run. They were also demonstrated the compost bags of button mushroom and application of casing soil after spawn run and thereafter the growing conditions and upkeep of bags in their growing room. Frequent follow-up visits are also made in the village for feedback from the trainees.

Spawn Production

So far during the current year, 4173.4kg of mushroom spawn was prepared and sold worth Rs. 2,92,143/- apart from this 18903.5kg mushroom compost worth Rs.1,51,228/- and fresh mushroom 1642.1kg worth Rs. 2,04,695/- have been prepared and sold. Total revenue of Rs. 6,48,066/- has been generated during the year 2015-16.

Success story

An off-campus training camp was organised in village Rit, Jaisinghpur block of Dist. Kangra. In this camp 15 women participated, out of which one lady Ms. Neelam of this village showed keen interest for growing mushrooms. Ms. Neelam is a widow and Asha worker of the village living with her young daughter in the small village. She has no source of income. At the first instance she was helped in preparing 11 bags for dhingri cultivation each containing one kilogram dry weight of wheat straw. From these 11 bags she could harvest a total of 8.950 kg of dhingri in the first instance. The yield of dhingri boosted her morale and she came forward to cultivate button mushroom. During December 2015 Ms. Neelam could manage to procure 90 bags of 10 kg compost each i.e. 900 kg of compost from the Indo-dutch Mushroom Project, Palampur. She then prepared bamboo shelves for the purpose and keeping all the sanitary and hygienic conditions Ms Neelam harvest more than 190 kilograms of button mushroom in total thereby showing the biological efficiency of around 22 % in the U3 strain supplied by Centre for Mushroom Research and Training, CSSK HPKV, Palampur. If such mushroom growers without receiving any type of training could grasp the technique by simple off-campus demo of two hours are encouraged they can change the scenario of mushroom cultivation in the surrounding areas.



Fig. 6.22. Ms. Neelam of village Rit cultivating record dhingri and button on first hand mushroom growing

Pant Nagar Centre

Training and demonstrations organized

Table 6.25. Training conducted and 144 Nos. participants had attended

Duration	Participants	Subject	Remarks
Sept. 08-12, 2015	40 Nos	Mushroom cultivation	Farmers -UP, UK, Bihar WB etc.
Nov. 26-27, 2015	07 Nos.	-do-	KVKs Scientists
Jan 19-22, 2016	22 Nos.	-do-	Farmers - UK etc
Feb. 05-07, 2016	39 Nos.	-do-	Farmers - Bihar
Mar. 03-09, 2016	36 Nos.	-do-	Farmers -UP, UK, Bihar, Nepal etc
Total participants	144 Nos.		



Fig. 6.23. Training and demonstrations organised by Pant Nagar centre

Kisan Mela

Farmers (387 no.) visited the centre during Kisan Mela w.e.f. Oct 01-04, 2015 and 213 no. of farmers during Kisan mela w.e.f. March 10-13, 2016. They were informed the mushroom production technology. They were also experienced by looking the standing crops of mushrooms at the centre. During Kisan Mela Gosthi is organized daily 3.00 – 6.00pm and the scientist answered their queries.

Spawn Supply

Comm. Spawn (Kg)			Master spawn (No.)			Cultures tube (No.)			Compost (Ton)	Casing soil (Qtl)
Button	Oyster	milky	Button	Oyster	milky	Button	Oyster	milky		
633	532	350	26	29	13	11	17	13	19.8	21
1515 kg			68 No. bottle			41 No. tube				

Museum Mushroom

Museum has already been developed at the centre and is being updated time to time

Distinguished visitors

- Dr. VP Sharma, Director, ICAR- Directorate of Mushroom Research, Solan visited on March 08-09, 2015
- Dr. Mangla Rai, Vice Chancellor, GBPUAT. Pantnagar visited the centre on Feb 09, 2016.

Pasighat Centre

During the year 2015-16, eight training programme including (on campus / off campus) on cultivation of Oyster mushroom and spawn production with a total 299 trainees (253 Female + 46 Male trainees) have been trained at Pasighat center. Three times different dignitaries also visited our spawn production

laboratory and mushroom house. Four times our exhibits are also display in various places of North Eastern Region of India. A total 5400 persons (4470 Female +930 Male persons) were aware mushroom and few are taken knowledge regarding how we can cultivate in this condition. Besides, two TV talk programme were under taken during the period on mushroom cultivation and spawn production techniques. The TV talk programmes were also telecast by the channel DD News. The project in charge also participated in 10 farmers' scientist interaction programme at various places. Ten students of B.Sc. (Hort.) Final Year were also trained for spawn production and cultivation of oyster mushroom under the experiential learning programme: Mushroom cultivation. Spawn production was increased over period of time. It was about 400 kg spawn sold to the growers. One hundred kg of fresh mushrooms are sold from our unit. Monthly visited the progressive Mrs. Oti Sitang, Mr. Talem Mize, Mrs. Osing Taboh and Mr. Bijoy Koirala production unit. Three other farmers are started mushroom production unit at different places of Arunachal Pradesh.

Table 6.26. On campus/off campus training programmes

Date	Venue	Particulars	No. of participant	No. of Female participant	No. of Male participant
4 th April, 2015	Namsing	Oyster mushroom	20	20	—
22 nd May, 2015	College campus	Oyster mushroom and spawn production	20	18	2
8 th June, 2015	Takilalung (ASG)	Oyster mushroom	50	35	15
9 th July, 2015	College Campus	Oyster mushroom and spawn production	60+4	60 (Graduate Girl students)	4 (Teacher)
20 th July, 2015	College Campus	Oyster mushroom and spawn production	60+5	40 (Girl Students)	20+5 (Boy Student and teachers)
18 th Feb, 2016	Dipa	Oyster mushroom	20	20	
12 th March, 2016	Kiyit	-do-	40	40	
18 th March, 2016	Dipa	-do-	20	20	
Total			299	253	46

Table 6.27. Visit of dignitaries

S. No.	Date	Name of visitors (dignitaries)
1.	7 th April, 2015	Members of Board of studies
2.	4 th March, 2016	Peer Review Team members
3.	6 th March, 2016	Hon'ble Member of Parliament Sri Ninong Ering

Table 6.28. Participation in Agri Expo, Kisan mela, exhibition and fairs etc

Date	Venue	Particulars	No. of visitors	No. of Female visitors	No. of Male visitors
13 th Aug, 2015	ATIC, KVK, East Siang	Exhibits (Fresh mushroom beds and spawn packets)	100	70	30
16-18 th Jan, 2016	College campus	Exhibits (Fresh mushroom beds and spawn packets)	3000	2500	500
3-5 th Feb, 2016	CVS & AH Mizoram	Exhibits (Fresh mushroom beds and spawn packets)	2000	1700	300
6 th Mar, 2016	Takilalung (ASG)	Exhibits (Fresh mushroom beds and spawn packets)	300	200	100
Total			5400	4470	930

Experiential Learning: Mushroom Production

Class: B.Sc. (Hort.) Final Year Student

Course Leader: Dr. P. Raja and Dr. R. C. Shakywar

No. of Students: 10

Duration: One semester (06 month from January to June 2016)

Supply of quality mushroom spawns to mushroom growers

Spawn production was increased over period of time. It was about 400 kg sold to the growers and 100 kg fresh mushrooms sold from our unit during 2015-16.

Feedback on diseases of respective areas

Monthly visited the progressive Mrs. Oti Sitang, Mr. Talem Mize, Mrs. Using Taboh and Mr. Bijoy Koirala production unit. Three other farmers are started mushroom production unit at different places of Arunachal Pradesh.



Fig. 6.24. Extension activities (Trainings) at Pasighat Centre



Fig. 6.25. Visit of dignitaries at Pasighat centre



Fig. 6.26. Participation in Agri Expo, Kisan mela , exhibition and fairs etc.

Ranchi Centre

Mushroom kit distributed under TSP-AICRP on Mushroom

Mushroom kits: 150 includes

- Mushroom Spawn: 1400 Packets
- pp bags: 50 Kg
- Master Tray: 150
- Dettol: 150 (each bottle 50 ml)
- Formaline : 40 Litres
- Carbendazim: 7.5 Kg (50 grs for each beneficiaries)
- Jute bags: 150 (one for each beneficiaries)
- Cotton: 10 pound
- Booklet/ technical bulletin:450 (mushroom booklet which we have published in 15-16)
- Plastic bottle for keeping formalin(Cap.250 ml): 150, Etc.

TSP-AICRP on Mushroom

During the year, 2015-2016, four on-farm training on mushroom were proposed for outreach the mushroom technology among the tribal women farmers of Ranchi, Gumla, Ramgarh, Dumka and Jamtara. But only three on farm training conducted during 2015-2016. A total 150 farmers were benefitted under this programme. In the TSP-AICRP on Mushroom, 50 tribal women farmers were selected from each selected district of Ranchi, Gumla and Dumka of Jharkhand. In December two on farms training were conducted one in Ranchi in village of Hahap and Sarwal and another at Ghaghara, Gumla while another on farm training was conducted in the first week of February, in the village of Guhijajori, Dumka, Jharkhand. In each district, total 50 women were trained in Mushroom cultivation and post harvest management of mushroom. Each farmer gets trained in oyster cultivation by getting hands on training as well as post harvest management of mushroom. After completion of the training, mushroom kits were distributed among the beneficiaries and each mushroom production kit contains eight packets of mushroom spawn, polypropylene bags, dettol, hand sprayer, formalin, Carbendazim, cotton, mushroom booklet along with master tray. After completion of the training, trained women farmers continuously growing mushroom in three district and they continuously engaged in growing mushroom and they also submitted several snaps (Fig).



Training on 17.12.2015 in Ranchi



Training on 17.12.2015 in Ranchi



Training on 18.12.2015 in Gumla



Training and mushroom kit distribution on 18.12.2015 in Ghaghra, Gumla



Training on 03.02.2016 in Guhijajori, Dumka



Training on 03.02.2016 in Guhijajori, Dumka



Training and mushroom kit distribution on 03.02.2016 in Guhijajori, Dumka



Training and mushroom kit distribution on 03.02.2016 in Guhijajori, Dumka



Growing oyster mushroom after getting training in Dumka

Fig. 6.27. Extension activities of Ranchi centre

Mushroom spawn production (2015-16)

Total planting spawn produced	4124 kg
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Farmers visited for knowledge on mushroom production technology and quality mushroom spawn

Total farmers visited	514
Total male visitors	110
Total female visitors	404

Establishment of spawn production laboratory in Jharkhand: 03

1. 'FLORA' in Telco, Jamshedpur
2. TSRDS, Jamshedpur
3. 'Mycelia' in Bariyatu, Ranchi (ISO certified)

Button production Unit established: 02

1. Mushroom tub near BIT, Ranchi
2. Erwa block, Ranchi

Sikkim Centre*Training Programmes organized*

Hands on Training Programme on Oyster Mushroom Spawn Production' for the tribal farmers of Sikkim under the aegis of Tribal Sub Plan during April 17-22, 2015 was organised at ICAR Sikkim Centre. This programme was organized with the aim to train the farmers on spawn production, mushroom cultivation, post-harvest management techniques of oyster mushroom to improve livelihood and nutritional security of the resource poor tribal farmers. 21 (19 women and 2 male) farmers from North and East Sikkim were trained on various aspects of mushroom cultivation in this training programme. Besides training, the necessary inputs like inoculation hood, pressure cooker, mother spawn, polythene envelopes and other ingredients required for mushroom production were distributed to the trainees. The participants were provided with copies of structured resource materials and relevant publications of the Institute.

One day training programme on Organic oyster mushroom cultivation (TSP) organized by ICAR Sikkim Centre at Nam Panang, Upper Dzongu, North Sikkim on January 04th, 2016. More than 50 farmers participated in this training programme.

Organic oyster mushroom cultivation organized by ICAR Sikkim Centre at He-Gyathang, Lower Dzongu, North Sikkim from February 03rd to 05th, 2016. More than 50 farmers participated in this training programme.

Demonstrations conducted

1. Practical demonstration on tissue culture in mushroom was done in a six day Hands on training on spawn production in oyster mushroom under Tribal Sub Plan organized by ICAR Sikkim Centre from 17-22, April. 2015.
2. Practical demonstration on media preparation for culturing of mushroom was done in a six day Hands on training on spawn production in oyster mushroom under Tribal Sub Plan organized by ICAR Sikkim Centre from 17-22, April. 2015..

3. Practical demonstration on preparation of substrate for mother spawn was done in a six day Hands on training on spawn production in oyster mushroom under Tribal Sub Plan organized by ICAR Sikkim Centre from 17-22, April. 2015.
4. Practical demonstration on mother spawn production was done in a six day Hands on training on spawn production in oyster mushroom under Tribal Sub Plan organized by ICAR Sikkim Centre from 17-22, April. 2015.
5. Practical demonstration on bed spawn production was done in a six day Hands on training on spawn production in oyster mushroom under Tribal Sub Plan organized by ICAR Sikkim Centre from 17-22, April. 2015.
6. Practical demonstration on organic mushroom cultivation was done in a six day Hands on training on spawn production in oyster mushroom under Tribal Sub Plan organized by ICAR Sikkim Centre from 17-22, April. 2015.

Participation in workshop

- Invited speaker at U.G.C sponsored National workshop on cultivation of edible mushroom: Techniques and agri-business prospects held at Dept. of Botany, Sarsuna college, Kolkata. 21st December, 2015.
- Delivered lecture on Wild edible mushrooms in Sikkim, organic mushroom cultivation and challenges in organic mushroom cultivation.

Spawn production: 300 kgs

Udaipur Centre

Training Programmes and awareness camp organized

Table 6.29. Off Campus Training

S.No.	Date & duration	Type of Mushroom	No. of Trainees	Native of Trainees
1.	06-08-2015 (One day)	Oyster, Button & Milky	41	KVK, Chittorgarh
2.	30-09-2015 (One day)	Oyster, Button & Milky	55	Ecological Task Force, Sri Mohangarh, Jaisalmer
Total			96	

Table 6.30. Lecturer in Summer School & Winter School

S.No.	Date & duration	Type of Mushroom	No. of Trainees	Native of Trainees
1.	06-06-2015 (One day)	Oyster, Button & Milky	27	CTAE, Udaipur
2.	23-11-2015 (One day)	Oyster, Button & Milky	150	Anand Agri. University, Gujrat
3.	15.12.2015 (One day)	Oyster, Button & Milky	25	CTAE, Udaipur
Total			202	

Table 6.31. On Campus Training programmes held from April 2015 to March 2016.

S.No.	Date & Duration	Type of Mushroom	No. of Trainees	Native of Trainees
1	16-04-2015 to 19-04-2015 (Three day)	Oyster	Entrepreneurs 5	254, Chatterjee Banglow, Shastri Circle, Udaipur
2	21-04-2015 to 25-04-2015 (four days)	Oyster & Milky	Farmers 6	Nai Haveli ka Chowk, Nathwara (Rajsamand)

S.No.	Date & Duration	Type of Mushroom	No. of Trainees	Native of Trainees
3	01-05-2015 to 06-05-2015 (Five days)	Oyster & Milky	Farmers 10	Niwas:- Hathai, Distt:- Dungurpur
4	16-06-2015 to 19-06-2015 (Four days)	Oyster & Milky	Farmers 10	Ganoda Road, Ward No. 4, Swangarh, Churu
5	25-06-2015 to 27-06-2015 (Three days)	Oyster & Milky	Entrepreneurs 15	Goverdhan Vilas, Sec-14, Udaipur
6	03-07-2015 to 06-07-2015 (four days)	Oyster & Milky	Entrepreneurs 15	The:- Vallabhnagar, P.S. Bhinder, Udaipur
7.	23-07-2015 (one days)	Oyster	Entrepreneurs 04	The; bali, Distt. Pali
8.	19-08-2015 to 21-08-2015 (Three days)	Oyster	Entrepreneurs 10	Village- Sub, Teh;- Chotisadri, Distt:- Pratapnagar
9.	11-09-2015 to 14-09-2015 (Three days)	Oyster	Entrepreneurs 09	Kotputli, Jaipur
10	28-10-2015 to 02-11-2015 (five days)	Oyster	Entrepreneurs 15	Gav:- Gajila, Post:- Shivpur, Teh: Mandal, Distt;- Bhilwara
11.	08-12-2015 to 10-12-2015 (Three days)	Oyster	Entrepreneurs 150	ATMA:- Ajmer, Nagaur
12.	05-01-2016 to 08-01-2016 (Three days)	Oyster	Entrepreneurs 20	V/P- Oda, Teh: Railmagra, Rajsamand
13.	22-01-2016 to 25-01-2016 (Three days)	Oyster	Farmer 20	V/P Pansal, Bhilwara
14.	29-01-2016 (one days)	Oyster,	Farmer 25	ATMA, Udaipur
15.	30-1-2016 (Three days)	Oyster	Farmer 30	ATMA, Jalore
16.	05-02-2016 to 08-2-2016 (Three days)	Oyster & Button	Farmer 10	Gav:- Chandraval, Teh:- Nathwara, Rajsamand
17	10-02-2016 (one days)	Oyster	Farmer 25	ATMA, Udaipur
18	11-02-2016 to 12-02-2016 (two days)	Oyster	Farmer 10	5-J-4, R.C.Vyas, Bhilwara
19.	18-02-2016 (One day)	Oyster , Button & Milky	Farmer 25	ATMA, Jalore
20.	02-03-2016 (One day)	Oyster & Button	Farmer 16	ATMA, Mandasaur
21	09-03-2016 (One day)	Oyster & Button	Farmer 52	BAIF, Ajmer
Total			482	

Table 6.32. Awareness Camp

S. No.	Date & Duration	Type of Mushroom	No. of Trainees	Native of Trainees
1	06-04-2015 (One day)	Oyster	Farmers 40	H.M. Sec:- 4, Udaipur
2	13-04-2015 (One day)	Oyster	Farmers 35	V/P -oda, Railmagra, Rajsamanad
3	12-05-2015 (One day)	Oyster	Farmers 35	124, gayatri Marg, Kota
4.	21 to 23-05-2015 (2 day)	Oyster	Farmers 50	Lohar gali, Pratapgarh
5.	26 to 29-05-2015 (3 day)	Oyster	Farmers 100	1-G-2, H.B. , Pratapnagar, Chittorgarh
6	01-06-15 (One day)	Oyster	Farmers 30	Magalward Road, Udaipur
7	10-06-15 (One day)	Oyster	Farmers 40	L-2/14, Jaishree colony, Udaipur
8	29-07-15 (One day)	Oyster	Farmer 10	5, new channer nagar, Ajmer

S. No.	Date & Duration	Type of Mushroom	No. of Trainees	Native of Trainees
9.	06-08-15 (One day)	Oyster	Farmer 20	Lambiya Station, Baneda, Bhilwara
10	11-08-15 (One day)	Oyster	Farmer 30	10, Vrandawan nagar, Bohra Ganesh ji, Udaipur
11.	04-09-15 (One day)	Oyster	Farmer 30	PG Nagar, Hadecha Road, Sachore, Jalore
12	28-09-15 (One day)	Oyster	Farmer 30	Gangrar, Chittorgarh
13	16-10-15 (One day)	Oyster	Farmer 50	709, Arjun nagar, Sec-11
14	28-10-15 (One day)	Oyster	Farmer 50	VPO Kapasan, Chittorgarh
15	20-11-15 (One day)	Oyster	Farmer 50	Mandore, Jodhpur
16	08-12-15 (One day)	Oyster	Farmer 40	Village:- Salera, Bhinder, Udaipur
17	08-12-15 (One day)	Oyster	Farmer 35	Village:- Saleda, Vallabhnagar
18	22-12-15 (One day)	Oyster	Entrepreneurs 9	B-128, Sector-14, Udaipur
19	04.1.2016 (One day)	Oyster	Entrepreneurs 20	3-J-25, Sec:-5, Udaipur
20	22-1-2016 (One day)	Oyster	Farmer 40	Sarana, Jalore
21	27-01-2016 (One day)	Oyster	Farmer 50	Udaipur
Total			759	

Involvement of women in training programmes: **125**

Development of Mushroom museum

A small mushroom museum is developed in AICRP having Five hundred twenty five wild mushroom flora and all cultivated mushrooms in dry as well as in wet form were preserved.

Supply of quality Mushroom Spawn: **700 Kg**



Fig. 6.28. Training programmes organized by Udaipur centre



Fig. 6.29. Off campus training programmes



Fig. 6.30. Visit of dignitaries

Vellayani Centre

Trainings conducted

Table 6.33. Training conducted by Vellayani centre

	Topic	Category	Date	No. of days	No. of participants
1	Spawn production and mushroom cultivation	Educated unemployed youth	26 th to 27 th May 2015	2	52
2	Spawn production and mushroom cultivation	Educated unemployed youth	11 th to 12 th August 2015	2	27
3	Spawn production and mushroom cultivation	Educated unemployed youth	19 th to 20 th October 2015	2	37
4	Spawn production and mushroom cultivation	Educated unemployed youth	29 th to 30 th December 2015	2	7
5	Mushroom cultivation	Mentally challenged students	April 20 th to May 13 th 2016	60 hrs	10

Spawn production in AICRP Mushrooms, Vellayani Centre (2015-16) **811 kg**



Mushroom trainees attending the theory session

Preparation of mushroom beds by trainees

Certificate distribution to the trainees by The Dean, CoA, Vellayani



Theory session for disabled students



Spawn preparation by disabled students



Disabled students preparing mushroom beds

Fig. 6.31. Extension activities by Vellayani Centre

Almora Centre

Trainings imparted

A total of twelve training programmes were conducted at the Institute where farmers/ beneficiaries were trained on mushroom cultivation technologies.

Table 6.34. Training conducted by Almora centre

Training	Date/duration	Beneficiaries	No. of participants
Improved production technologies for <i>kharif</i> crops	June 10-12, 2015	Farmers	26
Improved production technologies for <i>rabi</i> crops	August 22-24, 2015	Farmers	30
Improved production technologies for hill crops	September 1-3, 2015	Farmers	24
Training on Post-Harvest technologies	September 8, 2015	Farmers	12
Improved production technologies for <i>Rabi</i> crops	October 26-31, 2015	Farmers	30
Improved production technologies for <i>Rabi</i> crops	December 11-15, 2015	Farmers	30
Improved production technologies for hill crops	December 17-21, 2015	Farmers	24
Improved production technologies for <i>Rabi</i> crops	December 22-24, 2015	Farmers	32
Improved production technologies for hill crops	February 10-12, 2016	GRAMYA-2	26
Improved production technologies for hill crops	February 16-18, 2016	TSP	33
Improved production technologies for hill crops	February 22-24, 2016	GRAMYA-2	25
Improved production technologies for hill crops	February 25-27, 2016	GRAMYA-2	15
Total			307

Radio talk delivered: 01

Mushroom spawn supplied (in kg): 36 kg

Fresh mushroom (oyster) sold: 33.60 kg

KisanMela Organized

Institute organized two KisanMela on 08.04.2015 and 29.09.2015 at Experimental farm, ICAR-VPKAS, Almora where more than 800 farmers were participated. Farmers were exposed to mushroom cultivation technology.

Kisan Radio Programme

All India Radio, Almora organized Kisan Radio Karyakram in collaboration with ICAR-VPKAS, Almora at ICAR-VPKAS, Almora on Feb. 15, 2016. In the programme, farmers were told about the “Mushroom Cultivation in Hills”.

Hisar Centre

No. of (1-5 days) trainings at main campus: 9

Training's conducted at KVK's (3-5 days): 23

Mushroom day organized: 2

Mushroom spawn supplied to the growers of Haryana, Punjab and Rajasthan: 1986 kg

Coimbatore Centre

Training Programmes Organized

Table 6.35. Training conducted by Coimbatore centre

S.No.	One day training		Five day training		Special Training		Spawn Sold		Visitors
	No.	Persons	No.	Persons	No.	Persons	No. of bags	Qty.(kg)	
April 15	1	60	-	-	-	-	1022	305	66
May 15	1	70	-	-	-	-	528	158	82
June 15	1	77	-	-	-	-	496	148	126
July 15	1	81	-	-	-	-	450	134	270
August 15	1	106	-	-	-	-	305	91	255
September 15	1	93	-	-	1	51	2130	636	268
October 15	1	78	-	-	-	-	83	25	214
November 15	1	95	-	-	-	-	7	2	257
December 15	1	88	-	-	**1	31	2631	787	236
January 16	1	106	-	-	-	-	263	78	187
February 16	1	125	-	-	-	-	366	109	127
March 16	1	81	-	-	-	-	374	112	179
TOTAL	12	1060	-	-	2	82	8655	2585	2267

** Scientists and Teachers from different parts of India under Centre of Advanced Faculty Training in Agronomy (CAFTA), Dept. of Agronomy, TNAU, Coimbatore.

Table. 6.36. Gender wise Participation in Mushroom Training Programmes

S.No	One day Training No. & Date	No. of Participants		
		Men	Women	Total
1.	385 th dt: 6.4.2015	46	14	60
2.	386 th dt:5.5.2015	54	16	70
3.	387 th dt:5.6.2015	63	14	77
4.	388 th dt:6.7.2015	81	21	60
5.	389 th dt:5.8.2015	86	20	106

S.No	One day Training No. & Date	No. of Participants		
		Men	Women	Total
6.	390 th dt:7.9.2015	73	20	93
7.	391 th dt:12.9.2015	21	30	51
8.	392 th dt:5.10.2015	66	12	78
9.	393 th dt:5.11.2015	73	22	95
10.	394 th dt:7.12.2015	73	15	88
11.	395 th dt:9.12.2015	01	20	21
12.	396 th dt:5.12.2016	88	18	106
13.	397 th dt:5.2.2016	100	25	125
14.	398 th dt:7.3.2016	72	09	81
	Total	824	258	1111

Table. 6.37. Short Demo / Training Classes to School / College Students

S.No	Date	Name of the school / College	No. of participants		
			Staff	Students	Total
1.	8.4.2015	CSIA, Tindivanam.	46	-	46
2.	26.6.2015	AKR, Matriculation Hr. Secondary School,Tiruppur	-	86	86
3.	8.7.2015	Dr.Amruha S.Bhat, College of Horticulture, GKVK,Bangalor.	-	9	9
4.	24.7.2015	Kikani Vidhya Mandir School, R.S Puram, CBE.	4	43	47
5.	24.7.2015	PSC Public Schools,Coimbatore	4	60	64
6.	9.9.2015	SSA, DEO office Campus, Coimbatore	40	200	240
7.	11.9.2015	Achariya School, Coimbatore	20	200	120
8.	22.9.2015	P.M, Thoerar College, Visilam patti	4	55	59
9.	30.9.2015	Don Bosco College of Agriculture, Takkolam, Vellore.	4	53	57
10.	17.11.2015	KGBV, Kurichi, Coimbatore .	20	80	100
11.	18.11.2015	Yellow Train School, Mudali palayam.	10	70	80
12.	24.11.2015	Sree Sakthi Matric Hr School, Chettipalayam.	6	171	177
13.	9.12.2015	Chinmaya Vidyalaya, Kollangode.	4	29	33
14.	17.12.2015	SNS, Academy, Coimbatore.	5	48	53
15.	18.12.2015	KSG College of Arts & Science,singanallur, CBE	2	31	33
16.	11.1.2016	National Model HSS,Coimkbture.	4	64	68
17.	12.1.2016	National Model HSS, Coimkbture.	3	64	67
18.	13.1.2016	National Model HSS, Coimkbture.	4	64	65
19.	20.1.2016	Ethiraj College for Women,Chennai.	2	38	40
20.	24.2.2016	Adhiyaman College of Engineering, Hosur.	-	20	20
21.	25.2.2016	Chinmaya International Residential school, CBE.	-	37	37
22.	28.3.2016	K.K Wagh College of Agriculture, Nashik.	2	18	20

Table. 6.38. Special Training Classes to Self Help Groups / Farmer groups

S.No	Date	Name of the Organization	Staff	Trainees	Total
1.	20.5.2015	Ramar youth Integrated Womens organization, kamanithirai, Salem.	-	22	22
2.	28.5.2015	Ramar youth Integrated Womens organization, kamanithirai, Salem.	-	19	19
3.	19.10.2015	Block Resource Centre, P.N Palayam Block.	-	55	55
4.	19.10.2015	Block Resource Centre, Pollatchi, Anaimalai	-	67	67
5.	19.10.2015	Block Resource Centre, SSA,City Block, Coimbatore	-	40	40
6.	19.10.2015	Block Resource Centre, S.S, Kulam, Coimbatore	-	40	40
7.	19.10.2015	Block Resource Centre, S.S, Kulam, Ondipudur	-	39	39
8.	19.10.2015	SSA, Raja Street,CBE	-	67	67
9.	19.10.2015	SSA, Annur, Coimbatore	-	80	80
10.	19.10.2015	PUSM, Nallur.	-	10	10
11.	28.12.2015	Dept. of Horticulture, Kotagiri block, Nilgiris	3	50	53
12.	29.12.2015	Dept. of Horticulture, Kotagiri block, Nilgiris	4	38	42
13.	30.12.2015	Dept. of Horticulture, Kotagiri block, Nilgiris	3	63	66
14.	2.2.2016	CAFTA Trainin, Dept. of Agronomy, TNAU,CBE	-	19	19
15.	19.2.2016	DEDA, Namakkal	-	28	28

Teaching and Outreach Programmes

- One **ODL Course** on Mushroom Cultivation was conducted from 30.01.2016 to 25.06.2016 through the Directorate of Open Distance Learning, TNAU, Coimbatore. A total number of 12 students have registered for the course.
- UG – IV year BSc.,(Agri.), B.Tech (AIT) & B.Tech(Horti) students were taught PAT 451.Experiential Learning in Mushroom Production Technology (0+5) Course during VIII Semester 2015-16
- PG – One MSc., (Ag.) Plant Pathology student has completed his work on the “Exploration of bioactive compounds of *Pisolithus tinctorius* against soil borne plant pathogens”. The important findings of the thesis include

**Fig. 6.32.** Southern Regional Farmer's Day Exhibition – 2015 held at TNAU, Coimbatore



Fig. 6.33. AGRIIINTEX-2015 at CODDISSIA Trade Fair Complex, Coimbatore, out door mushroom pavilion, 17-20th July



Fig. 6.34. Tribal Training Programme on Mushroom Production and Minikit Distribution at Vazhavandhi village, Yercaud, Salem District Organized on 26th June 2015. Mrs. Shantha Sheela Nair, Rtd. IAS Officer and Dy. Chairman, State Planning Commission, TN, inaugurated the Programme

- One Ph.D Student is currently working on the “Exploration of Bioactive Molecules of Chinese caterpillar fungus *Ophiocordyceps sinensis* “ The salient findings include
- One Ph.D student is working on “Developing Innovative Systems and Modules for Oyster mushroom production”

7. PUBLICATIONS

Bhubaneswar Centre

Research Article

- Mohanty, S. and Mohapatra, K.B. 2015. Integrated management of seed and collar rot of groundnut caused by *Aspergillus niger* Van Tieghem. *International Journal of Tropical Agriculture* **33**(2):1631-1633.
- Mohanty, S., Nayak, N, Mohapatra, K.B. and Khandual, A. 2015. Efficacy of Biocontrol agent for management of Colletotrichum leaf spot of Gerbera. Paper presented at the National Conference on “Reinvigorating Agricultural Innovations for farmers’ Empowerment and Development” held at PJTSAU, Hyderabad from May 3-4, 2015.
- Debata, D.K., Mohapatra, K.B., Ranasingh, N. and Tudu, B.K. 2015. Evaluation of cultivation method of Paddy straw mushroom (*Volvariella volvacea*). *J.Pl.Dis. Sci.*, 10(1): 19-22.
- Sharma, V.P., Upadhyay, R.C, Kamal Shwet, Kumar Satish, Mohapatra, K.B. and Sharma Manju. 2015. Characterisation, cultivation, nutritional and medicinal properties of culinary edible mushroom, *Lentinus conatus*. *Sydowia* 65(1).
- Mohapatra K.B. 2015. Agribusiness through mushroom cultivation in Integrated Farming System. In: Integrated Farming System Practices: Challenges and opportunities (Ed. Prof. S.Nanda), New India Publishing Agency, New Delhi, India, Pp.317-344.
- Mohapatra, K.B., Pani, B.K. and Chiara, N. 2016. Role of mushroom cultivation in rural development. Souvenir, National seminar on “Horticultural diversity for prosperity. 10-12 February, 2016, OUAT, Bhubaneswar, Pp. 121-124.
- Mohapatra, K.B. and Chinara, N. 2016. Integrated disease management of vegetable crops grown under protected condition. Souvenir, National Seminar on “Resource based precision farming: Need of the day. 8-9 March, 2016, IMAGE, Bhubaneswar.
- Mohapatra, K.B. and Dora, D.K. 2016. Protected cultivation of mushroom: Strategies and operation needed. Souvenir, National Seminar on “Resource based precision farming: Need of the day. 8-9 March, 2016, IMAGE, Bhubaneswar.

Popular articles

- Mohapatra, K.B., Pani, B.K. and Chinara, N. 2016. role of mushroom cultivation rural development. Agri-vision. 2016. College of Agriculture, OUAT, Bhubaneswar. Pp. 52-55.
- Mohapatra, K.B. and Pattanaik, S.K. 2016. Mushroom cultivation: A profitable enterprise. Souvenir, Golden Jubilee celebration Nadpur High School, Mayurbhanj, 21-23 January, 2016.
- Dora, D.K. and Mohapatra, K.B. 2015. Mushroom cultivation in Odisha: Opportunities and challenges. Souvenir, Plant Lovers’ Association, Bhubaneswar, 2015.

- Mohapatra, K.B. and Chinara, N. 2015. Cultivation of paddy straw mushroom in protected condition: Opportunities and problems. Training manual on “Mushroom production and its value addition”, KVK, Keonjhar. Pp.40.
- Chinara, N. 2015. Mushroom spawn production. Training manual on “Mushroom production and its value addition”, KVK, Keonjhar. Pp.43.
- Mohapatra, K.B. 2015. Competitor molds and diseases of mushroom and their management. Training manual on “Mushroom production and its value addition”, KVK, Keonjhar. Pp.54.
- Mohapatra, K.B. 2015. Identification of some edible mushrooms. Training manual on “Mushroom production and its value addition”, KVK, Jharsuguda. Pp.11.
- Mohapatra, K.B. and Chinara, N. 2015. Status of mushroom cultivation in Odisha. Training manual on “Mushroom production and its value addition”, KVK, Jharsuguda. Pp.38.
- Mohapatra, K.B. and Chinara, N. 2015. Recent advances in spawn production techniques. Training manual on “Mushroom production and its value addition”, KVK, Jharsuguda. Pp.49.
- Mohapatra, K.B. and Chinara, N. 2015. Protected cultivation of mushroom: The subject deserves concern. Training manual on “Mushroom production and its value addition”, KVK, Jharsuguda. Pp.63.
- Mohapatra, K.B. and Chinara, N. 2015. Post harvest management of mushrooms: The need of the day. Training manual on “Mushroom production and its value addition”, KVK, Jharsuguda. Pp.49.
- Mohapatra, K.B. and Chinara, N. 2015. Mushroom Cultivation: An Agri-Business. Training manual on “Mushroom production and its value addition”, OUAT, Bhubaneswar. Pp.4-26.
- Chinara, N. and Mahapatra S.S. 2015. Spawn production. Training manual on “Mushroom production and its value addition”, OUAT, Bhubaneswar. Pp.26-30.
- Mohapatra, K.B. 2015. Mushroom spawn production. Training manual on “Mushroom production and its value addition”, OUAT, Bhubaneswar. Pp.81-86.
- Pani B.K. 2015. Utilisation of agro-waste in mushroom production. Training manual on “Mushroom production and its value addition”, OUAT, Bhubaneswar. Pp.98-101.
- Mohapatra, K.B., Pani, B.K. and Chinara, N. 2016. Mushroom Cultivation in rural development. Sovenir, Golden Jubilee Celebration, Nadpur High School, Mayurbhanj, 21-23 January, 2016.
- Mohapatra, K.B., Pani, B.K. and Chinara, N. 2016. Mushroom entrepreneurs' meet-2016: A bird's eye view., Krishak Bandhu Annapurna, XXIV (1): 37.

Theses (Ph.D)

Studies on improvement of biological efficiency of milky mushroom, *Calocybe indica*

Studies on fungi toxic potential of phytoextracts of forest origin

Participation in conference/ seminar/ workshop/symposium

National Symposium on “Emerging weed problems and their management in major field crops” Odisha Chapter, Indian Society of Agronomy, 8-9 October, 2015, OUAT, Bhubaneswar.

National Seminar on “Horticultural Diversity for Prosperity”, 10-12 February, 2016, OUAT, Bhubaneswar.

National Seminar on “Resource based Precision Farming: Need of the day”, 8-9 March, 2016, IMAGE, Bhubaneswar.

Pune Centre

Research articles

Jadhav, A. C., Shinde, D.B., Bhalerao, V.K. and A.M. Tirmali. (2015). Studies on effect of sulphatic microbial cultures with sulphur on growth and yield of green gram (*Vigna radiate* L.). J. Agric. Res. Technol. 40(1): 72-76.

Jadhav A.C. and D.B. Shinde. (2015). *Dhingri aalimbi: lagwad tantradhyan* (Marathi). No. MPKV/Res. Pub./ 174/ 2015

Shinde D.B. and A.C. Jadhav. (2015). Oyster (*dhingri*) mushroom cultivation. No. MPKV/Res. Pub./ 175/ 2015

Workshop/symposia/seminar attended

Dr. D.B. Shinde and Prof. A.C. Jadhav. XVII Annual Workshop of AICRP on Mushroom. DMR, Chambaghat, Solan (HP). 29-30 June 2015

Prof. A.C. Jadhav. Crop Micrometeorology. CAFT in Agril. Meteorology, College of Agriculture, Pune- 5. 29/09/2015 to 19/10/2015

Academic activities

In addition to mandatory research activities, the staff of mushroom project was also engaged in teaching activities.

Resource person	Courses taught
Dr. D. B. Shinde (Mycologist)	Under Graduate
	H-MIBO - 111 (1+1)
	AEL. ASDS-487 (0+1)
	Post Graduate
Prof. A.C. Jadhav (Jr. Mycologist)	MICRO-501 (3+1); MICRO-504 (2+1)
	MICRO-506 (2+1)
	*Two M. Sc. (Agri.) students for Post Graduate research work.
	Post Graduate
	MICRO - 502 (3+1)
	MICRO-505 (2+1)
	*One M. Sc. (Agri.) students for Post Graduate research work.

Raipur Centre

As Resource person

- H. K. Singh (2015). Alternate livelihood enterprises for sustaining livelihood (mushroom). Department of Agriculture
- H. K. Singh (2015). Mushroom As a Component in Integrated Farming Centre Govt. College Rajim
- H. K. Singh (2015). “ Expert System in Mushroom” State Agriculture Department under ATMA Project SAMITI Raipur 24 Feb 14
- H. K. Singh and C.S. Shukla: Rhastriya Krishi Vigyan Mela 2015 Organized by Confederation of Indian Industries.

M.Sc. Thesis guided: 03

- Intraspecific Compatible mating pairs of *Pleurotus flabellatus* and evaluation of dikaryons for strain improvement. **Major Advisor: C.S. Shukla**
- Intraspecific Compatible mating pairs of *Pleurotus florida* and evaluation of dikaryons for strain improvement. **Major Advisor: C.S. Shukla**
- Studies on Milky mushroom production in Chhattisgarh. **Major Advisor: H.K.Singh**
- Documentation of Mushroom flora of Chhattisgarh and their antimicrobial properties . **Major Advisor: G. K. Awadhiya**

Nauni Centre

Research publications

- Pal Joginder, Suman BC and Gupta Dharmesh.2015.Effect of different nitrogen and carbon sources on the vegetative growth of *Pleurotus pulmonarius*. Indian Journal of Mushrooms **33**(1):1-4.
- Pal Joginder, BC Suman and Dharmesh Gupta.2015.Effect of different solid and liquid culture media on mycelial growth of *Pleurotus pulmonarius*. Indian Journal of Mushrooms **33**(1):23-26.
- Chauhan Praneet, Dharmesh gupta and BC Suman.2015.Physiological studies of pink oyster mushroom *Pleurotus djamor* var. *roseus*. Indian Journal of Mushrooms **33**(1):34-35.
- Chauhan Praneet and Dharmesh gupta .2015. Bioconversion of low quality lignocellulosic agricultural waste into edible protein by *Pleurotus djamor* (Rumph) Boedijin. International Journal of Bioresource and Stress Management **6**(1): 135-139.

Research papers presented in national symposium

- Gupta Dharmesh.2015. An innovative energy saving technology for the preparation of grain spawn. In: National symposium on “Holistic Approaches for Plant Health Management” Deptt. of Plant Pathology, UHF, Nauni w.e.f.28-29 Sep.2015.pp.159-160.

Gupta Dharmesh and R Jarial.2015.Utilizing thermophilic fungi in the preparation of *A.bisporus* compost. In: National symposium on “Holistic Approaches for Plant Health Management” Deptt. of Plant Pathology, UHF, Nauni w.e.f.28-29 Sep.2015.pp.159.

Sharma JP,Singh NB,Benal Rakesh and **Dharmesh Gupta.2015.** Cultivation of shiitake mushroom on selected clones of willow(*Salix* species) : A case study under PPP mode. Abst. No. ICBSM2927.p.225. Presented in 2nd International Conference on Bio-resource and stress management during 7-10th Jan.2015 at PJTSAU, Rajendranagar, Hyderabad, India.

Articles

Gupta Dharmesh.2015. Sustainable development of mushrooms and non-green revolution. In: National symposium on “Holistic Approaches for Plant Health Management” Deptt. of Plant Pathology, UHF, Nauni w.e.f.28-29 Sep.2015.pp.41-43.

Book Chapters

Suman BC, Gupta Dharmesh, Khanna PK, Chandel Reena, Kapoor S and Joshi VK. 2016. Technology of Mushroom Production and its Postharvest Technology. pp 717-762. In: Indigenous Fermented Foods of South Asia (Eds. VK Joshi) CRC Press. Taylor & Francis, Boca Raton, Florida.

Extension bulletin

Singh NB, Gupta Dharmesh, Sharma JP and Vikas Benal. 2015. Parmar Vishwavidyalaya dwara anumodit vyuns(Willow) par shiitake mushroom ki vyabsaik kheti. Directorate of Extension Education, Dr.Y.S.Parmar University of Horticulture and Forestry, Nauni, Solan (HP).16p.

National and International symposium/conferences attended

Attended the national symposium on “Holistic Approaches for Plant Health Management” being held in Deptt. of Plant Pathology, UHF, Nauni w.e.f.28-29 Sep.2015.

Attended IPS 6th International Conference on “Plant,Pathogens and People” at NAAS complex, New Delhi w.e.f. 23-26 Feb.2016.

Pusa Centre

Popular article

Dayaram (2016) Jalvayu parivartan ke Anukul hai Mushroom Utpadan. Chhatrak (communicated).

Dayaram (2016) : Mushroom Utpadan Taknik in Santhali language, RAU, Pusa.

दयाराम (2016) ओट चासहा रेयाक टकमीक (मशरूम उत्पादन तकनीक) सन्थाली भाषा में साहित्य तैयार किया, रा0कृ0वि0, पूसा द्वारा प्रकाशीत।

Ranchi Centre

Technical bulletins

“Oyster Mushroom (Dhingari) Utpadan Technique” by Sudarshan Maurya

“Dudhiya Mushroom ki Utpadan Technique” by Sudarshan Maurya and Reshma Shinde

“Purvi Bharat me shwet button mushroom ki kheti” by Sudarshan Maurya, Jaipal Singh Choudhary and Moanaro

Udaipur Centre

Research Articles

Birendra Kumar Mehta, Sanjay Kumar Jain, Gyanendra Prakash Sharma, **Anila Doshi**, and H K Jain, 2015, Optimization of Osmotic Drying Parameters for Button Mushroom (*Agaricus bisporus*)-Part I, Mushroom Research Vol(25) in press

B K Mehta, S K Jain*, G P Sharma, **Anila Doshi**, and H K Jain, 2015, Osmotic Dehydration of Button Mushroom (*Agaricus bisporus*) : Optimization of Process Parameters-Part 2, Mushroom Research Vol (25) in press.

Meena Narayan Lal, Anila Doshi and R.D.Meena 2015, Prevalence pathogenic and Morphological Characterization of *Rhizoctonia Bataticola* Isolates causing Charcoal Rot of Peanut in Southern Rajasthan. J.Pl.Dis.sci.vol 10(2) 169-174

Meena Narayan Lal, Anila Doshi and R.D.Meena 2015, Effect of Environmental factors on progress of Charcoal Rot Development of Groundnut caused by *Rhizoctonia bactaticola*. Research journal of Agriculture Sciences 6(6):1367-1370.

Meena Narayan Lal, Anila Doshi 2015. Effect of Oil cakes and fungal Bioagents for Management of Charcoal Rot of Peanut caused by *Rhizoctonia bactaticola* Research journal of Agriculture Sciences 6(6):1253-1257

Technical Bulletin

Dr. Anila Doshi, Kala Nath, Avinash Kumar Nagda. 2015. Mushroom ki Vibhin Prajatiyu ka Utpadan, Parirakhan avam Vipnan. AICRP Mushroom.

Thesis

Jiterndra kumar Sharma 2016 “Epidemiology and Management of Bacterial Leaf spot of Green Gram [*Vignaradiata*(L.) Wilczek] Caused by *Xanthomonas axonopodispv. vignaeradiatae* (Sabet et al.) Dye

Vellayani Centre

Research articles

Deepa Rani C.V and Dr. Lulu Das. 2015. “Effect of different carbon and nitrogen sources on the vegetative growth of Shiitake mushroom (*Lentinula edodes* (Berk.) Pegler. International Journal of Applied and Pure Science and Agriculture.1(6):14-18

Lulu Das. 2016. ‘Prospects of mushroom cultivation for suitable agri business’ Invited country paper presented at the Asian food and agri business conference held at Bandung Indonesia from March 28th to 30th 2016.

Lulu Das. 2016. "Unleashing the potential of mushroom value addition in India" Paper accepted for poster presentation in the forth coming ISMS 2016 to be held at Amsterdam from 28th May to 1st June 2016.

Popular Articles

Bincy .S. Basheer and Dr. Lulu Das. 2016."Tricholoma- A new addition to edible mushroom flora of Kerala" Kerala Calling January 1 ,2016, pp.48-50.

Sminu Cherian and Dr. Lulu Das. 2016. "Chakiri chor compost akkam" Karshakan January 2016, pp 32-33.

Jeen Shaji and Dr. Lulu Das. 2016. "Paal koon athayathinum arogyathinum" Karshakan February 2016, pp 34-35.

Amala Mary George and Dr. Lulu Das. 2016. "Hymavatabhoovile Amrith" Karshakan February 2016, pp 36-37.

Thesis submitted under the guidance of Dr. Lulu Das, PI during 2015-16.

"Standardisation of techniques for cultivation of Button mushroom (*Agaricus* sp.) in Kerala" by Lishma N.P. (M.Sc. Ag.), 2015.

"Suitability of locally available substrates for cultivation of Pink Oyster mushroom" by Arathi R. H. (M.Sc. Biotechnology), 2015.

" Strain evaluation and production technology of Shiitake mushroom (*Lentinula edodes* (Berk.) Pegler)" by Deepa Rani C.V (Ph. D.), 2016.

Conferences /Seminar/workshops attended

Making Kerala inclusive and accessible for people with disability, Science and technology museum, Trivandrum on 3rd December 2015

SAARC regional expert consultation meeting, Mascot hotel, Trivandrum during 28th to 30th December 2015

Asian food and agri business conference, Horison hotel Bandung, Indonesia, 28th to 30th March 2016



Fig. 8.1. Dr. Lulu Das at the SAARC meeting



Fig. 8.2. Dr. Lulu Das attending Asian Food Conference

Almora Centre

Research articles

Mishra K. K., Pal R. S. and J.C. Bhatt (2015). Comparison of antioxidant properties in cap and stipe of *Lentinula edodes*-a medicinal mushroom. *Emirates Journal of Food and Agriculture*. 27(7): 562-569.

Mishra K. K., Pal R. S., Mishra, P.K. and J.C. Bhatt (2016). Antioxidant activities and mineral composition of oyster mushroom (*Pleurotus Sajor-caju*) as influenced by different drying methods. *Asian J. Chemistry*. (Accepted).

Technical bulletin

Mishra KK, Stanley J, Jain SK and Bhatt J.C. (2015). Parvatiya kshetramein mushroom utpadantakniki. Technical Bulletin 37 (1/2015), ICAR-VPKAS, Almora. pp 66.

Presentations in Conference/Symposia/Seminar/other

Mishra, K.K., Pal, R.S., Mishra, P.K. and Pattanayak, A. (2016). Antioxidant activities and mineral composition of oyster mushroom (*Pleurotus sajor-caju*) as influenced by different drying methods. In: National Conference on Hill Agriculture in Perspectives at GBPUAT, Pantnagar from Feb. 26-28, 2016.

Radio talk delivered

Delivered radio talk on "Button mushroom utpadan hetu compost kanirman" at All India Radio, Almora on 27.08.2015.

Coimbatore Centre

Research articles

Krishnamoorthy, A.S. and Venkatesh Balan. 2015. A Comprehensive Review of Tropical Milky White Mushroom (*Calocybe indica* P&C). *Mycobiology* **43(3)**: 184-194

Sangeetha, C., Krishnamoorthy, A.S. and Ramakrishnan, S. 2015. Testing bioactive compounds of Chinese caterpillar fungus, *Ophiocordyceps* spp against root nematode (*Meloidogyne incognita*). *Research Journal of Agricultural sciences*. **6(6)**: 1129-1133.

Sangeetha, C., Krishnamoorthy, A.S., Nakkeeran, S., Ramakrishnan, S and Amirtham, D. 2015. Evaluation of bioactive compounds of *Ophiocordyceps sinensis* (Berk.) Sacc. Against *Fusarium* spp. *Biochemical and cellular Archive*. **15(2)**: 431-435.

Senthilmurugan, S. and Krishnamoorthy, A.S. 2015. Growth promoting Mycobacteria, *Acinetobacter calcoaceticus* and *Agrobacterium tumefaciens* (*Rhizobium radiobacter*) isolated from oyster mushroom mycelium. *Research Journal of Agricultural sciences*. **6(6)**: 1190-1193.

Senthilmurugan, S. and Krishnamoorthy, A.S. 2015. Innovative containers for oyster mushroom cultivation. *International journal of Tropical agriculture*. **33(3)**: 2107-2111.

Srinivasan, V.M., Krishnamoorthy, A.S., Kuttalam, S., Raguchander, T. and Chinnamuthu, C.R. 2014. Performance evaluation of Azoxystrobin in the control of *Phytophthora infestans* (Mont.) de Bary on Potato. *Pestology*. **38(4)**: 52-55.

Srinivasan, V.M., Krishnamoorthy, A.S., Kuttalam, S., Raguchander, T. and Chinnamuthu, C.R. 2014. Performance Evaluation of Azoxystrobin in the control of fruit rot and powdery mildew diseases on chilli. *Science Park Research Journal* **1(36)**:1-6

Teaching and Student Research Projects

One **ODL Course** on Mushroom Cultivation was conducted from 31.01.2016 to 27.06.2016 through the Directorate of Open Distance Learning, TNAU, Coimbatore. A total number of 25 students have registered for the course.

UG – IV year BSc., (Agri.) students were taught PAT 451 . Experiential Learning in Mushroom Production Technology 0+5 Course during VIII Semester 2014-15. Twenty five UG students registered for the course.

Handled PAT.601. Advanced Mycology (2+1) t Course to Ph.D students

Guided 3 MSc.(Agri.) and 3 Ph.D Students for their Thesis Project

PG and Ph.D Student Projects

Master's Thesis

Kirankumar, N. Studies on Molecular basis of Morphogenesis, Chlamydo spores production, Shelf life and Yield of *Volvariella* spp

Jothi, R. Standardization of Liquid spawn for the Production of Paddy Straw Mushroom

Akshaya, S.B. Studies on the Formulation and Testing of Antifungal Biomolecules of *Ophiocordyceps sinensis* against Selected Phytopathogens.

Doctoral Thesis

Sangeetha, C. Exploration of Bioactive Antifungal Potentials of Chinese Caterpillar Fungus *Ophiocordyceps sinensis* against Seedling blight, Root rot and Wilt Pathogens

Senthilmurugan, S. Developing Innovative Systems and Modules for Oyster Mushroom Cultivation

Priyadharshini, B. Studies on Genetic Variability, Morphogenesis and Fruiting body Architecturing of Milky Mushroom (*Calocybe indica* P&C)

Awards/Medals/ Recognitions

Dr. A.S.Krishnamoorthy, Professor and PI working in the Scheme has been given with the additional charge of Professor & Head, Department of Plant Pathology, CPPS, TNAU, Coimbatore w.e.f 01.04.2016

One Ph.D student of Dr.A.S.Krishnamoorthy has been awarded UGC – Rajiv Gandhi National Fellowship for conducting research on “ Genetic Variability, Morphogenesis and Fruiting body Architecturing of Milky mushroom (*Calocybe indica* P&C).

8. PERSONNELIA

Staff position at various AICMIP Centres during 2015-16

Sl.No	AICRP Centre	Name of staff	Designation
A. ICAR Institute based Coordinating Centre			
1	ICAR Research Complex for NEH Region, Umiam 793 103, Meghalaya	Dr Pankaj Baiswar	Sr. Scientist, Plant Pathology
2	ICAR Sikkim Centre, Tadong, Gangtok-737102 (Sikkim)	Dr. R. Gopi	Scientist, Plant Pathology
3	ICAR Research Complex for NEH Region, Arunachal Pradesh Centre, Basar-791101, Arunachal Pradesh	Dr Raghuveer Singh	Scientist, Plant Pathology
4	ICAR Research Complex for NEH Region, Nagaland Centre, Jharnapani, Medziphema - 797 106, Nagaland	Dr. Rajesha G	Scientist (Plant Pathology)
5	ICAR Research Complex For NEH Region, Mizoram Centre, Kolasib 796 081, Mizoram	Dr A. Ratan Singh	Scientist (Plant Pathology)
6	ICAR Research Complex for NEH, Region. Manipur Centre, Lamphelpat, Imphal - 795 004	Dr Hemavati Ranebennur	Scientist (Plant Pathology)
7	ICAR Research Complex for NEH, Tripura Centre, Lembucherra, Tripura West, Pin 799210	Dr. Susheel Kumar	Scientist (Plant Pathology)
8	ICAR Research Complex for Eastern Region, Research Centre, Plandu, Ranchi 834010 (Jharkhand)	Dr. Sudarshan Maurya	Sr. Scientist, Plant Path
9	ICAR-Central Island Agri. Res. Institute, Port Blair (Andaman & Nicobar Island)	Mr K. Sakthivel	Scientist (Plant Pathology)
10	ICAR-Indian Institute of Horticultural Research, Bangalore	Dr. Meera Pandey	Pri. Scientist (Plant Pathology)
B. SAU based Coordinating Centre			
1	Dept. of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore - 641 003	Dr AS Krishnamoorthy Th.P.Arumugam Th.P.Karuppusamy Th.C, Sundararajan Th.Venkatesan Th. P.Selvaraj	Professor Laboratory Assistant Lab Assistant Lab.Tecnician Skilled mazdoor
2	Centre for Tropical Mushroom Research and Training, Dept. of Plant Pathology, Orissa Agricultural University, Bhubaneswar, Orissa	Dr. K.B. Mohapatra	Associate Professor
3	Dept. of Plant Pathology, College of Agriculture, CCS Haryana Agricultural Univ., Hisar - 124 005	Dr. Surjit Singh	Professor
4	Department of Microbiology, College of Basic Sciences and Humanities, Punjab Agricultural University, Ludhiana – 144 001.	Dr (Mrs) S. Dhanda Dr. H. S. Sodhi Dalip Singh Mr. Gurdev Singh Harminder Kr Ram Kumar	Sr. Mycologist Sr. Mycologist Sr Laboratory Assist. Fieldman Typist-cum-Clerk Beldar
5	Mushroom Research and Training Centre, G.B. Pant University of Agri. & Tech., Pantnagar – 263 145 (Uttarakhand)	Dr. KPS Kushwaha Dr SK Mishra Mr. Himanshu Joshi Sh. Ramakant Singh Shri Santosh Kumar Sh. Deo Kumar	Mycologist JRO- Mushroom Technical Assist. Jr. Assist./Fieldman Typist/clerk Beldar

Sl.No	AICRP Centre	Name of staff	Designation
6	Dept of Plant Pathology, Collage of Horticulture and Forestry, Central Agricultural University, Pasighat – 791 102 (Arunachal Pradesh)	Dr. RC Shakywar	Assistant Professor
7	Plant Pathology Section, College of Agriculture, Mahatma Phule Krishi Vidyapeeth, Pune-411 005	Dr. D.B.Shinde Dr. AC Jadhav Shri V. K. Bhalerao Shri. N. G. Desai Shri.S. G. Hingmire Shri. Y.S. Bhawe	Mycologist Jr. Mycologist Jr. Res. Asstt Agril. Asstt. LDC/Typist Beldar
8	Mushroom Research Laboratory, Dept. of Plant Pathology, Indira Gandhi Krishi Vishwavidyalaya, Raipur – 492 006 (Chhattisgarh)	Dr. G. K. Awadhiya Dr. Harvinder Singh Shri B. L. Sinha Shri R. K. Pandey Shri A. R. Sahu	Mycologist Assistant Mycologist Field Assistant LDC Peon (Beldar)
9	Department of Microbiology, Faculty of Basic Sciences and Humanities, Rajendra Agricultural University, Pusa (Samastipur) - 848 125 (Bihar)	Dr. Dayaram	Associate Professor
10	Dept. of Plant Pathology, Rajasthan Collage of Agriculture, Maharana Pratap University of Agric. & Tech., Udaipur – 313 001 (Rajasthan)	Dr. Anila Doshi Mrs. Kala Nath Mr. Nathu Singh Mr. Kishan Singh	Mycologist Field Supervisor L.D.C. Beldar
11	Department of Plant Pathology College of Agriculture Vellayani – 695 522 Thiruvananthapuram, (Kerala)	Dr. Lulu Das Ms. Deepa Rani	Mycologist Technical Assistant
12	CSK HPKV, Palampur (HP)	Dr. Subhash Dhancholia	Prof. (Plant Pathology)
C. State Govt based Coordinating Centres			
1	Haryana Agro Industrial Corperation R & D Centre, Opp. DCR University, G.T. Road, Murthal, Sonapat (Haryana)	Dr. Ajay Yadav	Scientist
D Cooperating centres			
1	Mushroom Research & Production Unit, Department of Mycology and Plant Pathology, Dr. Y.S. Parmar Univ. of Horticulture and Forestry, Nauni – 173 230, Solan (HP)	Dr. Dharmesh Gupta	Sr. Scientist
2	ICAR-VPKAS Almora, 263 601, Uttarakhand	Dr. KK Mishra	Sr. Scientist
3	Division of Plant Pathology, Faculty of Agriculture, SKUAST-J, Main Campus Chatha, Jammu (J&K)- 180 005	Dr Sachin Gupta	Assist. Prof.
4	Mushroom Research and Training Centre, Division of Plant Pathology, SKUAST-Kashmir, Shalimar, PIN 191121, Kashmir	Dr Shaheen Kauser	Sr. Scientist
5	Dept of Plant Pathology, Assam Agricultural University, Jorhat-785013, District Jorhat, Assam	Dr. Dilip Kumar Sarmah	Principal Scientist
6	Dept. of plant Pathology, SVBPU&T, Meerut (UP)- 25011	Dr Gopal Singh	Associate Prof.
7	Dept. of Plant Pathology, Faculty of Agriculture, Bidhan Chandra Krishi Vishvavidyalaya, Mohanpur (WB)- 741 252	Dr (Ms) Rishu Sharma	Assist. Prof.
8	Deptt. Of Plant Pathology, SD Agricultural University Sardar, Krushinagar – 385506 (Gujrat)	Dr. K.K. Patel	Associate Prof.
9	Dept. of Plant Pathology, SV Agriculture College, Tirupati- 517 502	Mr. Gurivi Reddy	Assist. Prof.

9. BUDGET / RELEASED 2015-16

Centre	Recurring Contingency (Rs. Lakh)				NEH		TSP		Non-Recurring Contingency (Rs. Lakh)		Total (Rs. Lakh)
	Estt. Charges		Contingency including FLD and TA		a	b	a	b	Equipments and Works		
	a	b	a	b					a	b	
PAU, Ludhiana	42.00	42.00	1.20	1.20	—	—	—	—	1.15	1.15	44.35
TNAU, Coimbatore	30.87	30.87	1.30	1.30	—	—	—	—	4.30	4.30	36.47
NDU&T, Faizabad	5.33	5.33	—	—	—	—	—	—	—	—	5.33
MPKV, Pune	33.00	33.00	1.30	1.30	—	—	—	—	6.10	6.10	40.40
GBPUA&T, Pantnagar	16.00	16.00	1.20	1.20	—	—	—	—	5.50	5.50	22.70
IGKV, Raipur	28.00	28.00	0.30	0.30	—	—	17.00	17.00	2.70	2.70	48.00
MPUAT, Udaipur	34.80	34.80	0.30	0.30	—	—	1.00	1.00	4.70	4.70	40.80
KAU, Kerala	15.00	15.00	0.30	0.30	—	—	1.00	1.00	—	—	16.30
HAU, Hisar	3.00	3.00	1.15	1.15	—	—	—	—	2.30	2.30	6.45
OUAT, Bhubneshwar	3.00	3.00	0.20	0.20	—	—	1.00	1.00	4.40	4.40	8.60
RAU, Samastipur	5.00	5.00	0.30	0.30	—	—	1.00	1.00	—	—	6.30
CAU Pasighat	3.00	3.00	0.30	0.30	8.00	8.00	—	—	2.00	2.00	13.30
HAIC, Murthal	—	—	1.15	1.15	—	—	—	—	—	—	1.15
HPKV, Palampur	3.00	3.00	1.20	1.20	—	—	—	—	—	—	4.20
ICARRC Estern region, Ranchi	—	—	0.20	0.20	—	—	13.00	13.00	2.50	2.50	15.70
ICAR RC for NEH Region	—	—	1.80	1.80	9.00	9.00	6.00	6.00	54.35	54.35	71.15
ICAR RC, Sikkim	—	—	**	**	**	**	**	**	**	**	**
ICAR RC, Arunachal Pradesh	—	—	**	**	**	**	**	**	**	**	**
ICAR RC, Nagaland	—	—	**	**	**	**	**	**	**	**	**
ICAR RC, Mizoram	—	—	**	**	**	**	**	**	**	**	**
ICAR RC, Tripura	—	—	**	**	**	**	**	**	**	**	**
ICAR RC, Manipur	—	—	**	**	**	**	**	**	**	**	**
ICAR-CARI, Port Blair	—	—	1.40	1.40	—	—	—	—	—	—	1.40
IIHR, Bangalore	—	—	1.30	1.30	—	—	—	—	—	—	1.30
UHF, Nauni	—	—	1.59	1.59	—	—	—	—	—	—	1.59
VPKAS, Almora	—	—	1.20	1.20	—	—	—	—	—	—	1.20
SKUAST, Kashmir	—	—	1.30	1.30	—	—	—	—	—	—	1.30
SKUAST, Jammu	—	—	1.20	1.20	—	—	—	—	—	—	1.20
AU Assam	—	—	1.00	1.00	—	—	—	—	—	—	1.00
SVBP, Meerut	—	—	1.20	1.20	—	—	—	—	—	—	1.20
BCKVV, Kalyani	—	—	1.70	1.70	—	—	—	—	—	—	1.70
DAU, Gujrat	—	—	0.80	0.80	—	—	—	—	—	—	0.80
ANGRAU Hyderabad	—	—	1.30	1.30	—	—	—	—	—	—	1.30

a- sanctioned amount

b- actual release

** = The funds are released to ICAR-RC, Barapani for further release to its regional centres.

