

वार्षिक प्रतिवेदन
ANNUAL REPORT
2011-12

अखिल भारतीय समन्वित खुम्ब अनुसंधान परियोजना
All India Coordinated Research Project on Mushroom



खुम्ब अनुसंधान निदेशालय
DIRECTORATE OF MUSHROOM RESEARCH

(भारतीय कृषि अनुसंधान परिषद्)
(Indian Council of Agricultural Research)

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Chambaghat, Solan - 173 213 (H.P.), India

ANNUAL REPORT 2011-12
All India Coordinated Research Project on Mushroom
Directorate of Mushroom Research
Solan - 173 213, India

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Cover page : Top to bottom
Button mushroom crop at Pusa, Samastipur
Oyster mushroom crop at Raipur
Shiitake mushroom growing at Udaipur
Oyster mushroom crop at Bhubaneswar
Brown button mushroom crop at Nauni, Solan
Paddy straw mushroom crop at Solan

Printed at

: Yugantar Prakashan (P) Ltd, New Delhi – 110064
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Preface

Mushrooms have been collected from forest and consumed by various people across the globe. The medicinal value of mushrooms has also been recognized by many of the early civilizations of Chinese, Greeks, Egyptians, Romans and Mexican, etc. The great Greek philosopher Hippocrates (400 B.C.) hypothesized “Let food be your medicine and medicine be your food”. Mushrooms supplement and complement the nutritionally deficient cereals and are regarded as the highest producers of protein per unit time and area. It is, thus, very important to collect, characterize, conserve, categorize and exploit the mushroom biodiversity.

Though Chinese were the first to do the artificial cultivation of the tropical and subtropical mushrooms about thousand years ago but the real commercial ventures started when Europeans started cultivation of button mushroom in caves during mid 16th century. High demand for mushrooms in Europe and America makes them an important horticultural crop and foreign-exchange earner. Indian mushroom industry is of recent origin and started in late 1960s with cultivation of button mushroom but at present number of other mushroom species has been brought under cultivation in the country. Our country has varied agro-climate, massive biodiversity, colossal amount of agricultural wastes and cheap labour, but contributes only 1% of the world mushroom production.

The present production of the country has touched 1.2 lakh tons. During the initial years, the growth rate was slow but after 1985, the mushroom production in India witnessed a sharp increase. 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 IGKVV, 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.

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 2011-12 was finalized in the annual workshop organized at DMR, Solan on 1-2 August 2011.

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, oyster mushroom, and evaluate locally available agro-industrial wastes as casing materials for button mushroom and standardize cultivation technology of specialty mushrooms, which are needed to diversify the mushroom cultivation scenario in the country.

During the year 2011-12, strainal evaluation trials were given preference over cultivation trials. Strain evaluation trials of white button mushroom on long method of compost recorded the maximum yield of 16.80kg/100 kg of compost in the strain U-3 followed by the strain NCS-100 at Samastipur centre (15.48 kg). In the pooled data over 6 locations NCS-100 and NCS-101 were the best yielders. The overall average showed the maximum fruit body weight in the strains NCS-101 and Bel-2 indicating good quality fruit body in all the climatic conditions. In another set of experiment on evaluation of *A. bisporus* strain using short method of

compost, maximum yield of 22.23kg /100 kg of compost was recorded in the strain NCH-102 followed by strain Bel-2 at the Murthal centre (20.63 kg). The average fruit body weight was the maximum in strain U-3 followed by Bel-2, S-454 and Delta. 10 newly developed button mushroom strain (5 white strains and 5 brown strains) were evaluated for their yield potential and climatic adaptability. Amongst white strains, maximum yield of 22.8 kg /100 kg of compost was recorded in the SSI-3 closely followed by SSI-2 (22.65kg) at the Murthal centre. The maximum fruit body weight of 15.90 g was recorded in SSI-3 followed by SSI-2 (15.33g). Amongst brown strains, the maximum yield of 25 kg /100 kg compost was recorded in SSI-6 at the Murthal centre closely followed with SSI-7 with yield of 23.18 kg at the Nauni centre. Amongst five strains of *Volvariella volvacea* tested, the maximum biological efficiency of 25.8kg/100 kg of dry substrate was recorded in strain Vv-01 followed by 18.8kg in strain Vv-12. Amongst six high yielding strains of *Pleurotus* spp., the maximum yield of 104.2kg /100 kg of dry substrate was obtained in strain Pl-11-02 followed by strain Pl-11-01 (99 kg). A total of five high yielding strains of *Lentinula edodes* were under evaluation trial. The maximum yield of 53.64kg /100 kg of dry substrate was obtained in strain OE-388 followed by OE-38 with a yield of 47.39 kg on sawdust substrate. The maximum yield on wheat straw substrate was recorded 45.00kg/100 kg dry substrate in strain OE-16 followed by OE-22.

In crop production trials, use of *Alcaligenes faecalis* inoculation in button mushroom casing recorded significant yield enhancement in all the casing mixtures with a maximum yield of 22.85kg/100 kg of compost in the casing mixture made up of FYM + Spent compost + bacterium. The average fruit body weight varied at different centre and no correlation could be found with the casing material and treatment. The second experiment on total indoor composting was assigned to five different centres where tunnel facility was available. At four centres, no increase in yield was recorded except at Solan centre where only a marginal increase in yield could be observed. Overall average yield showed 11.3 kg /100 kg compost in indoor composting technology.

The results of various experiments exhibited a vast scope of commercialization of mushroom farming as secondary agriculture. Depending upon the climatic conditions and availability of raw materials, the mushroom varieties and raw materials can be identified to promote mushroom cultivation in a particular region. Also, India is rich in mushroom biodiversity and has a large number of mushroom species suiting to different climatic conditions. Hence it is the time to diversify the cultivated mushroom profile of our country so that minimum energy is required during mushroom cultivation and making mushroom cultivation more profitable venture in near future.

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कृषि विज्ञान केंद्र

अखिल भारतीय समन्वित खुम्ब अनुसंधान परियोजना के अंतर्गत चौदह समन्वित तथा दो सहयोगी केन्द्र हैं जो देश के विभिन्न जलवायु क्षेत्रों में स्थित हैं। ये मशरूम की विभिन्न तकनीकियों तथा उन्नत किस्मों का सत्यापन करने के लिये तकनीकी कार्यक्रम के अनुसार प्रयोग करते हैं। वर्ष 2010-11 में विभिन्न केन्द्रों पर किये गये परीक्षण 1-2 अगस्त, 2011 को खुम्ब अनुसंधान निदेशालय, सोलन में आयोजित कार्यशाला में तय किये गये थे।

वर्ष 2011-12 के दौरान फसल उन्नयन में पांच प्रयोग किये गये जिनमें चार विभिन्न मशरूमों श्वेत बटन मशरूम (*एगोरिकस बाईस्पोरस*), आयस्टर मशरूम (*प्लूरोटस* प्रजाति), पुआल मशरूम (*वॉल्वेरियेला वॉल्वेसिया*) व शिटाके मशरूम (*लेन्टिनुला इडोडस*) के प्रजाति मूल्यांकन पर प्रयोग किये गये। श्वेत बटन मशरूम (*एगोरिकस बाईस्पोरस*) की लम्बी विधि द्वारा तैयार खाद के साथ किये गये प्रजाति मूल्यांकन में अधिकतम उपज (16.80 कि०ग्रा०/100 कि०ग्रा० खाद) प्रजाति यू-03 तत्पश्चात् प्रजाति एन.सी.एस.-100 (15.48 कि०ग्रा०) में समस्तीपुर केन्द्र पर पाई गई। जबकि हिसार केन्द्र पर सर्वाधिक उपज 15.4 कि०ग्रा० एन.सी.एस.-101 प्रजाति में प्राप्त की गई। कुल मिलाकर एन.सी.एस.-100, यू-3 एवं एन.सी.एस.-101 प्रजातियों ने औसतन सभी केन्द्रों पर अच्छा प्रदर्शन किया। प्रथम तुड़ान (पश्च केसिंग) एन.सी.एस.-100, एस.-11, ए-15 एवं एस.-130 में सबसे कम 15 दिन उदयपुर केन्द्र पर दर्ज की गई जबकि पूसा केन्द्र पर यह समय 18-21 दिन तक रहा। औसत फलनकाय का सर्वाधिक वजन 13.70 ग्राम लुधियाना केन्द्र पर प्रजाति यू-3 एवं एस-11 (13.60 ग्राम) प्रजाति में पाया गया। एक अन्य प्रयोग में लघु विधि द्वारा तैयार खाद पर बटन मशरूम प्रजातियों का मूल्यांकन किया गया तथा सर्वाधिक उपज 22.23 कि०ग्रा०/100 कि०ग्रा० खाद प्रजाति एन.सी.एच.-102 एवं बेल-2 (20.63 कि०ग्रा०) में पंतनगर केन्द्र पर दर्ज की गई। कुल मिलाकर प्रजाति एस.-130, एन.सी.एच.-102 एवं बेल-1 ने औसतन 16.85, 15.63 एवं 15.52 कि०ग्राम की उपज से अच्छा प्रदर्शन किया। प्रथम तुड़ान का समय सबसे कम 17 दिन प्रजाति एन.सी.एच.-102 में पंतनगर केन्द्र पर तथा 18 दिन प्रजाति एन.सी.एच.-102 एवं यू-3 में सोलन एवं पूणे केन्द्रों पर क्रमशः पाया गया। फलनकायों का औसत भार 10.2-16.4 ग्राम तक पाया गया जबकि फलनकायों का सर्वाधिक वजन प्रजाति यू-3, बेल-2, एस.-454 एवं डेल्टा में पूणे केन्द्र पर पाया गया।

बटन खुम्ब की 10 नई प्रजातियों का मूल्यांकन छोटी विधि द्वारा बनाई गई खाद पर 6 केन्द्रों पर किया गया। इन 10 प्रजातियों में पांच श्वेत एवं पांच भूरे रंग वाली प्रजातियां थीं। श्वेत प्रजातियों में सर्वाधिक उपज 22.8 कि०ग्रा०/100 कि०ग्राम खाद प्रजाति एस.एस.आई.-3 में मूर्थल केन्द्र पर तथा 22.65 कि०ग्राम उपज पंतनगर केन्द्र पर प्रजाति एस.एस.आई.-2 में पाई गई। औसतन सर्वाधिक उपज 17.85 कि०ग्राम एस.एस.आई.-2 में दर्ज की गई। प्रथम तुड़ान में सबसे कम समय 13 दिन एस.एस.आई.-3 में मूर्थल केन्द्र पर दर्ज किया गया। फलनकायों का औसत भार 15.9 ग्राम एस.एस.आई.-3 में सोलन केन्द्र पर पाया गया। भूरी प्रजातियों में सर्वाधिक उपज 25 कि०ग्राम/100 कि०ग्राम खाद एस.एस.आई.-6 में मूर्थल केन्द्र पर तथा एस.एस.आई.-7 में नौणी केन्द्र पर पाई गई। औसतन 19.35 कि०ग्राम उपज एस.एस.आई.-6 में सभी केन्द्रों पर पाई गई। प्रथम तुड़ान में सबसे कम समय 14 दिन मूर्थल केन्द्र पर एस.एस.आई.-6 में तथा सर्वाधिक 28 दिन एस.एस.आई.-10 में सोलन केन्द्र पर दर्ज की गई।

पुआल मशरूम की पांच प्रजातियों को पांच अलग-अलग केन्द्रों पर मूल्यांकित किया गया। सर्वाधिक जैविक क्षमता 25.8 प्रतिशत (कि०ग्रा०/100 कि०ग्रा० सूखे पोषाधार) पर प्रजाति वी.वी.-12 में कोयम्बटूर केन्द्र तथा 16.10 प्रतिशत प्रजाति वी.वी.-11 में भुवनेश्वर केन्द्र पर दर्ज की गई। प्रथम तुड़ान में सबसे कम 10 दिन प्रजाति वी.वी.-1 में तथा 11 दिन प्रजाति वी.वी.-11 में कोयम्बटूर केन्द्र पर दर्ज की गई। फलनकायों का औसत वजन सर्वाधिक 23.1 ग्राम वी.वी.-13 प्रजाति में कोयम्बटूर केन्द्र पर प्राप्त हुआ। साधारणतः सभी प्रजातियों में सर्वाधिक फलनकाय का वजन कोयम्बटूर केन्द्र पर प्राप्त हुआ।

ढींगरी मशरूम की पांच उच्च उत्पादन क्षमता वाली प्रजातियों का मूल्यांकन 12 विभिन्न केन्द्रों पर किया गया। सर्वाधिक उपज 104.2 कि०ग्राम/100 कि०ग्राम सूखे पोषाधार पर प्रजाति पी.एल.-11-02 में रांची केन्द्र पर तथा प्रजाति पी.एल.-11-01 (99 कि०ग्रा०) में कोयम्बटूर केन्द्र पर पाई गई। रायपुर, बारापानी, भुवनेश्वर एवं सोलन केन्द्रों पर सर्वाधिक उपज पी.एल.-11-03 में तथा वेल्थोनी, समस्तीपुर एवं रांची में पी.एल.-11-06 प्रजाति में पाई गई। प्रथम तुड़ान में सबसे कम 19 दिन का समय प्रजाति पी.एल.-11-02 एवं पी.एल.-11-04 में रायपुर केन्द्र पर तथा पी.एल.-11-05 में भुवनेश्वर केन्द्र पर प्राप्त हुई। फलनकायों का सर्वाधिक वजन 19.4 ग्राम पी.एल.-11-03 प्रजाति में बड़ापानी केन्द्र पर प्राप्त हुआ तथा सबसे कम 4.8 ग्राम पी.एल.-11-01 में कोयम्बटूर केन्द्र पर प्राप्त हुआ।

शिटाके मशरूम की पांच प्रजातियों का मूल्यांकन आठ विभिन्न केन्द्रों पर किया गया। सर्वाधिक उपज सोलन केन्द्र पर 53.64 कि०ग्राम/100 कि०ग्राम सूखे लकड़ी के बुरादे पर प्राजति ओ०ई०-388 में तथा 47.39 कि०ग्राम ओ०ई०-38 प्रजाति में पाई गई। गेहूं के पुआल पर सर्वाधिक उत्पादकता 45 कि०ग्राम प्रजाति ओ०ई०-16 एवं ओ०ई०-22 में कोयम्बटूर केन्द्र पर दर्ज की गई। फलनकायों का सर्वाधिक वजन 81.25 ओ०ई०-16 प्रजाति में सोलन केन्द्र पर पाई गई।

फसल उत्पादन में कुल तीन प्रयोग किये गये। बटन मशरूम के उत्पादन पर बैक्टीरिया एल्कैलीजीन्स फिकैलिस के असर का परीक्षण कुल आठ केन्द्रों पर किया गया। इस प्रयोग में कुल आठ केसिंग मिट्टियों का प्रयोग किया गया जिसमें गोबर की खाद, स्पेंट मशरूम कंपोस्ट, नारियल के रेशे तथा उनके मिश्रणों का प्रयोग किया गया। बैक्टीरिया द्वारा बटन मशरूम के उत्पादन में वृद्धि सुनिश्चित करने हेतु ये प्रयोग किये गये तथा बटन मशरूम के उत्पादन में महत्वपूर्ण वृद्धि पंतनगर केन्द्र पर सभी केसिंग मिट्टियों में बैक्टीरिया के निवेशन से प्राप्त की गई। इस प्रयोग में सर्वाधिक उत्पादन (22.85 कि०ग्राम/100 कि०ग्राम कंपोस्ट) गोबर की खाद स्पेंट मशरूम कंपोस्ट बैक्टीरिया में पंतनगर केन्द्र पर प्राप्त हुई। प्रथम तुड़ान में सबसे कम समय 18.7 दिन सोलन केन्द्र पर गोबर की खाद एवं स्पेंट कंपोस्ट की केसिंग, जिसमें बैक्टीरिया का निवेशन नहीं किया गया था, में प्राप्त हुई। सभी केन्द्रों पर बैक्टीरिया के निवेशन से ज्यादा से ज्यादा एक दिन की कमी प्रथम तुड़ान में दर्ज की गई। औसत फलनकायों का वजन विभिन्न केन्द्रों पर अलग-अलग पाया गया तथा केसिंग मिट्टी या उसके उपचार से फलनकायों के वजन पर कोई प्रभाव नहीं देख गया।

एक अन्य प्रयोग में बटन मशरूम के लिये पूर्णतः अंदरूनी खाद बनाने की विधि का मूल्यांकन पांच विभिन्न केन्द्रों पर किया गया। इन पांच में से दो केन्द्रों पर यह प्रयोग असफल रहा तथा तीन केन्द्रों पर इस विधि से बनाई गई खाद द्वारा अच्छी उपज प्राप्त नहीं हुई। यद्यपि इस विधि द्वारा बनाई गई खाद में बदबूदार गैसों का निकास नहीं हुआ। औसत उपज 11.3 कि०ग्राम/100 कि०ग्राम खाद में प्राप्त हुई जा कि मानक विधि द्वारा बनाई गई खाद से कम रही।

जंगली गुददेदार कवकों को एकत्र करने, उन्हें पहचानने व संरक्षित करने के उद्देश्य से विभिन्न केन्द्रों द्वारा सर्वेक्षण किये गये। इन सर्वेक्षणों में इस बात का ध्यान रखा गया कि जो मशरूम किसी क्षेत्र विशेष की जनता द्वारा आम तौर पर खाये जाते हैं उन्हें भी एकत्र एवं संरक्षित किया जाये। इन नमूनों से जहां तक संभव हो सके शुद्ध संवर्धन प्राप्त किये गये। कुल 61 मशरूमों के नमूने उदयपुर केन्द्र से, 14 भुवनेश्वर से, 18 पासीघाट से, 65 पूणे से, 16 समस्तीपुर से, 10 रांची से, 7 बड़ापानी से, 22 रायपुर से, 13 पंतनगर से, 12 कोयम्बटूर से, 15 वेल्थानी केन्द्र एवं 143 मुख्यालय से एकत्रित किये गये। ज्यादातर केन्द्रों ने इन एकत्रित मशरूमों का संरक्षण अपने-अपने तौर पर किया है परन्तु कुछ केन्द्र जैसे कि रायपुर, रांची एवं उदयपुर ने कुछ शुद्ध संवर्धनों को निदेशालय में जमा करवाया है। सभी केन्द्रों पर बीमारी एवं कीटों के अध्ययन हेतु सर्वेक्षण एवं निरीक्षण का कार्य किया गया। लगभग सभी केन्द्रों पर अलग-अलग रोगजनक कवकों का संक्रमण दर्ज किया गया जिसमें से प्रमुख एसपरजीलस, ट्राइकोडर्मा, कोपराईनस, राईजोपस, स्कलेरोशियम, पेनिसिलियम, सेपीडोनियम एवं माईकोगॉन थे। ये रोगजनक कवक पूरे देश में मशरूम की फसल को नुकसान पहुंचाते हुए पाए गए जबकि माईकोगॉन एवं सेपीडोनियम पंजाब, हरियाणा, हिमाचल प्रदेश एवं उत्तराखंड के फार्मों पर ज्यादा तौर पर देखे गये। कीट-पतंगों में मुख्यतः फोरिड, स्प्रिंगटेल एवं माईटस मशरूम की फसल में पाए गए जबकि वेल्थानी केन्द्र पर सियारिड मक्खियों का संक्रमण पाया गया। सभी परियोजना केन्द्रों ने राष्ट्रीय/राज्य स्तरीय प्रदर्शनियों एवं मेलों में भाग लिया तथा आकाशवाणी व दूरदर्शन पर मशरूम से संबंधित वार्ताओं को प्रसारित कर प्रसार की गतिविधियों को बढ़ाया। इसके अतिरिक्त किसानों व मशरूम उत्पादकों को पत्रों, दूरभाष, ईमेल व फार्म भ्रमण द्वारा सलाह-मशवरा दिया गया। सभी केन्द्रों पर किसानों, बेरोजगार युवकों, महिलाओं एवं उद्यमियों के लिये विभिन्न अवधियों के प्रशिक्षण शिविर लगाये गये। लगभग सभी केन्द्रों ने अपने क्षेत्र में मशरूम उत्पादन को बढ़ावा देने हेतु शुद्ध संवर्धन एवं खुम्ब बीज किसानों को उपलब्ध करवाया।

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 (2011-2012), the research trials were conducted at all the sixteen centres based on technical programme finalized during the annual group meeting of AICRPM workers held on 1-2nd August 2011 at DMR, Solan.

During the year 2011-12, five experiments were conducted on strainal evaluation of four different mushrooms i.e. white button mushroom (*Agaricus bisporus*), oyster mushroom (*Pleurotus* spp.), paddy straw mushroom (*Volvariella volvacea*) and shiitake mushroom (*Lentinula edodes*) at various centres. Strain evaluation trials of white button mushroom on long method of compost was conducted at five centres and the maximum yield of 16.80 kg per 100 kg of compost was recorded in the strain U-3 at Pusa (Samastipur) Centre followed by in the strain NCS-100 at the same centre (15.48 kg). NCS-101 was the best performing strain at Hisar centre with the average yield of 15.4 kg. Overall best average productivity was recorded in NCS-100 followed by U-3 (12.69 kg) and NCS-101 (12.63 kg per 100 kg compost). The time taken to first harvest (days post casing) was recorded minimum 15 days in strains NCS-100, S-11, A-15 and S-130 at Udaipur centre followed by NCS-101 and Bel-1 strains 16 days each. At Pusa Centre the time taken for first harvest ranged from 18 -21 days. Overall average showed the minimum time taken for first harvest was 20.2 days in the strain NCS-100. The maximum fruit body weight recorded at Ludhiana centre was 13.7 g in strain U-3 closely followed by strain S-11 (13.6 g). The overall average shows the maximum fruit body weight in the strains NCS-101 and Bel-2 indicating good quality fruit body in all the climatic conditions.

In another set of experiment on evaluation of *A. bisporus* strain using short method of compost, maximum yield of 22.23kg /100 kg of compost was recorded in the strain NCH-102 at Pantnagar centre followed by strain Bel-2 at the same centre (20.63 kg). Overall average yield of all the strains at all the centres showed that S-130 followed by NCH-102 and Bel-1 with an average yield of 16.85, 15.63 and 15.52 kg were the performing strain in all the conditions. The time taken for first harvest when crop is raised using steam-pasteurized compost was minimum 17 days post casing in strain NCH-102 at Pantnagar Centre followed by 18 days in the same strain and strain U-3 at Solan and Pune centres, respectively. The average fruit body weight ranged from 10.2 to 16.4 g with maximum in strain U-3 at Pune centre followed by Bel-2, S-454 and Delta at the same centre.

Another experiment was conducted with 10 newly developed button mushroom strain (5 white strains and 5 brown strains) for assessing their yield potential and climatic adaptability through multilocal trials. These were tested on short method pasteurized compost and hence the experiment was assigned to the centres, namely, Pune, Pantnagar, Nauni, Solan, Ludhiana and Murthal. Amongst white strains, maximum yield of 22.8 kg /100 kg of compost was recorded in the SSI-3 at Murthal centre closely followed by SSI-2 at Pantnagar centre (22.65kg). The strain SSI-2 yielded at par with SSI-3 at Murthal centre with a yield of 21.8 kg/100 kg compost. Overall average of all the strains at all the centres showed that all the selections have performed well over the control with maximum yield of 17.85 kg in SSI-2. Amongst white strain the quickest time for first harvest was recorded as 13 days post casing in SSI-3 at Murthal centre. The quickest first harvest time was recorded at Murthal centre in all the accessions. Amongst white strains the maximum fruit body weight of 15.90

g was recorded in SSI-3 followed by SSI-2 (15.33g) at Solan centre. Good fruit body weight was also recorded at Pune Centre in almost all the strains with a maximum of 15.3g in SSI-4 and SSI-1.

Evaluation of the brown strains showed the maximum yield of 25 kg /100 kg compost in SSI-6 at Murthal centre closed followed with SSI-7 with yield of 23.18 kg at Nauni centre. Overall average of all the centres showed that all the four strain performed better than control with a maximum average of 19.35 kg in SSI-6. The quickest first harvest time of 14 days was recorded at Murthal centre in SSI-6 while maximum of 28 days in the control i.e. SSI-10 at Solan centre. The maximum fruit body weight was recorded to 15.6 g in brown strain control at Pune centre.

A total of five strains of *Volvariella volvacea* were tested at five different locations. The maximum biological efficiency of 25.8kg/100 kg of dry substrate was recorded in strain Vv-01 at Coimbatore centre followed by 18.8kg in strain Vv-12 at the same centre. It was also recorded that the maximum biological efficiency for all the test strains was achieved at the Coimbatore centre. Good biological efficiency was also recorded at Bhubaneshwar centre with a maximum of 16.10 g /100 kg straw in the strain Vv-11. The minimum time taken for the first harvest was 10 days in strain Vv-01 at Coimbatore centre and 11 days in strain Vv-11 at the same centre. The average fruit body weight varied at different centres with a maximum of 23.1g at Coimbatore centre in the strain Vv-13 while the minimum fruit body weight was recorded to be 7.8g at Solan centre in the strain Vv-11.

The trial on evaluation of high yielding strain of oyster mushroom was conducted at 12 different centres. A total of six strains were under trial. The maximum yield of 104.2kg /100 kg of dry substrate was obtained in strain Pl-11-02 at Ranchi Centre followed by strain Pl-11-01 (99 kg) at Coimbatore centre. At Raipur, Barapani, Bhubaneshwar, and Solan centres the best performer strain was Pl-11-03 with 75.7, 74.0, 86.1 and 81.0 kg mushroom yield, respectively, while at Vellayani, Samastipur and Ranchi centres, and the best performer strain was Pl-11-06. The minimum time taken of 19 days for first harvest of the crop was recorded in strain Pl-11-02, Pl-11-04 at Raipur centre and Pl-11-05 at Bhubaneshwar centre. The overall average of all the centres showed the time taken in first harvest ranged between 31 to 35 days in all the strains. Average fruit body weight of all the strains at different centre ranged between 4.8 to 19.4 g. The maximum fruit body weight of 19.4 g was recorded in Pl-11-03 strain at Barapani centre while the minimum of 4.8 g was recorded in Pl-11-01 strain at Coimbatore centre.

The trial on strain evaluation of shiitake mushroom was conducted at eight different centres. A total of five high yielding strains of *Lentinula edodes* were under evaluation trial. At two centres viz., Pune and Murthal, the experiment is under progress and results are not submitted yet. At Udaipur and Pantnagar centres, higher yields were obtained on wheat straw while at Solan higher yields were recorded on sawdust substrate. The maximum yield of 53.64kg /100 kg of dry substrate was obtained in strain OE-388 at Solan centre followed by OE-38 with a yield of 47.39 kg on sawdust substrate. The maximum yield on wheat straw substrate was recorded 45.00kg/100 kg dry substrate in strain OE-16 at Coimbatore centre followed by OE-22 at the same centre. Overall average yield at all the centres showed that the strain OE-388 performed the best both on sawdust and wheat straw based substrate with an average yield of 29.35 and 30.66, respectively. The maximum fruit body weight of 81.25g was recorded in OE-16 strain at Solan centre while the minimum of 11.05 g was recorded in strain OE-28 at Udaipur centre.

In crop production trials, a total of three experiments were designed, which included use of bacterium *Alcaligenes faecalis* in casing of white button mushroom, standardization of total indoor composting technology for button mushroom and cultivation of *Macrocybe giganteum* mushroom. The first experiment on use of

bacterial inoculation in button mushroom casing was assigned to eight centres. Eight different treatments were tested which included FYM, Spent mushroom substrate and coir pith alone and in combination. The bacterial inoculation was tested for probable yield enhancement in button mushroom. Significant yield enhancement was recorded at Pantnagar, Pune, Pusa, Udaipur and Solan centre by inoculating the bacterium *Alcaligenes faecalis* in all the casing mixtures with a maximum yield of 22.85kg / 100 kg of compost in the casing mixture made up of FYM + Spent compost + bacterium at Pantnagar centre. At Ludhiana centre, yield enhancement was noticed by bacterial inoculation in the casing mixture composed of FYM+SC and Coir pith + FYM. In other treatments at Ludhiana instead of yield enhancement, a decrease in yield was recorded. At Faizabad centre also same trend was noticed. However at Pune centre yield enhancement was noticed. Overall average showed yield enhancement by inoculation of bacterium *Alcaligenes faecalis*. The time taken in first harvest (days post casing) was recorded to be the minimum of 18.7 days in FYM+spent compost without bacterial inoculation at Solan centre. At other centres also there was a maximum of one day early first harvest was recorded in the treatment of bacterial inoculation. The average fruit body weight varied at different centre and no correlation could be found with the casing material and treatment.

The second experiment on total indoor composting was assigned to five different centres where tunnel facility was available. A new method of compost preparation inside the tunnel was developed at DMR, Solan, which neither causes any air pollution nor causes any noxious gas emission. The technology as such was put for multilocation trials along with traditional short method technology as check. Out of five centres Murthal centre could not do it as the cultures of thermophiles did not multiplied. In all the other four centres no increase in yield was recorded except at Solan centre where only a marginal increase in yield could be observed. Nevertheless, at all the centres the crop could be grown satisfactorily without emission of foul gases. Also it was evident the quantity of compost produced was higher in total indoor composting technique. Overall average yield showed 11.3 kg /100 kg compost in indoor composting technology. The minimum time taken for first harvest was 14 days in indoor compost at Solan centre. Also at Ludhiana centre the time taken for first harvest was lower in indoor compost but in all other centres the time taken was recorded to be higher in total indoor compost than check. Average fruit body weight was also found to be lower in indoor compost than check except at Ludhiana centre where the average fruit body weight was at par in both the composts.

1. INTRODUCTION

With a view 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.

Initially, the All India Coordinated Mushroom Improvement Project started with six Centres. At present, 14 Coordinating and two co-operating Centres are working under AICRPM. These are:

ICAR Institute based

- ICAR Research Complex for NEH Region, Barapani (Meghalaya)
- ICAR Research Complex for Eastern Region Research Centre, Ranchi (Jharkhand)

State Agricultural Universities based

- 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)

Co-operating Centres

- Dr.Y.S.Parmar University of Horticulture & Forestry, Nauni, Solan (HP).
- Haryana Agro-Industrial Corporation Research and Development Centre, Murthal (Haryana)

The last Group meeting of workers of AICRPM was held on 1-2nd August 2011 at Directorate of Mushroom Research, Solan. During the meeting the progress of last year was monitored and technical programme for 2011-2012 was finalized.

2. MANDATE AND OBJECTIVES

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 2011-12

I. CROP IMPROVEMENT

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

- a) Participating centres All
- b) Data to be recorded
- Rainfall and temperature data coinciding with the appearance/arrival of wild edible mushrooms in local markets.
 - ITK, exact location of collection, method of consumption and other uses along with photographs/video of the natural habitat/market and soil sample of the location.
 - Accession without deposition in DMR Gene Bank may not be included in AICRP-Mushroom Annual Report.
 - Information of market, ITKs, method of consumption, any other uses etc. may be included.
 - Sun dried fruit bodies/spore prints may also be supplied along with cultures.
 - GPS data of the region from where mushroom was collected
 - Enclosed proforma may be filled as much as possible.
- c) Area of operation • Each Centre may select at least five districts inhabiting variable mushroom flora
- d) Proforma for market data on mushroom collected

Sl. No.	Item to be recorded	Observation/data
1.	Name/market/District	
2.	Date of collection	
3.	Sale price (Rs./kg)	
4.	Mode of consumption (fresh/dried/both/raw/cooked as vegetable/with rice etc.)	
5.	Any association with tree(s)/soil type etc.	
6.	ITK if any	
7.	Temperature range during the collection period (15-20, 20-25, 25-30, 30-35°C)	

Collected By.....

Date of collection	Specimen No.		Culture No.	Locality and GPS Data	
Habitat Dung Leaf litter Lignicolous	Smell	Taste	Vegetation community		Spore Print colour

A. PILEUS

Diameter	Colour	Shape	Margin
Surface on touch (Sticky/non sticky)	Hygrophanous/non hygrophanous		Scales

B. STIPE

Attachment	Colour	Stipe size & length	Stipe shape	Stipe base
Central Lateral Excentric				

C. RING

D. VEIL

E. VOLVA

F. BASAL ASSOCIATION

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G. LAMELLAE

Gill attachment (free, adnate, adnexed, decurrent)	Gill colour	Gill edges
Edible / non edible/medicinal		

Any other information

Note: Good photographs showing pileus, stipe, lamellae, ring, volva & base of stipe.

Expt. 02: Testing of different strains of white button mushroom, *Agaricus bisporus*

- a) Participating centres
- **Pune, Pantnagar, Solan, Nauni, Murthal (Pasteurized compost using wheat straw)**
 - Udaipur, Ludhiana, Faizabad, Hisar, and Samastipur (Long method of composting)
- b) Substrate
- Substrate quantity- 10 kg compost/bag
 - No. of replications- 4 replications each with 6 bags of 10 kg compost/replicate for each strain in RBD.
- c) Strains to be evaluated
- **Short method compost (ABS-01, ABS-02, ABS-03, ABS-04, ABS-05, ABS-06, ABS-07, ABS-08)**
 - Long method compost (ABL-01, ABL-02, ABL-03, ABL-04, ABL-05, ABL-06, ABL-07, ABL-08)

d) Methodology to be adopted

Short Method

- 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, colour, pH, moisture, ammonia, bulk density (kg per m³) may be reported for each trial

Long Method

- Long method compost to be prepared in single phase outdoors (without steam pasteurization) in 28 days (+6, 10, 13, 16, 19, 22, 25, 28 days and spawn).
- Ingredients to be used are wheat/paddy straw-1000kg, wheat bran-80 kg, Urea-18 kg, Gypsum- 40 kg and cotton seed meal 30 kg. Data for N, moisture, pH, colour, ammonia and bulk density (kg per m³) are to be recorded for each trial.

- e) Spawning rate to be 0.7% of wet compost used

f) Data to be recorded during 4 weeks cropping

Strain	Days taken for					Mushroom yield (kg/100 kg compost)	Incidence of diseases/ insect-pests	Av. Wt. of mushroom	Mushroom quality/remark
	1	2	3	4	5				

(1-Spawn run; 2- Case run; 3- Pinning (after ventilation); 4- First harvest (days post casing), 5- last harvest (cropping days))

g) Environmental conditions to be maintained inside cropping room

- Spawn run (bed temp.)-Bed Temp- 24±1⁰C, RH-90 to 95%, CO₂ – above 10,000 ppm.
- Case run (bed temp.)-Bed Temp- 24±1⁰C, RH-90 to 95%, CO₂ – above 10,000 ppm.
- Cropping (bed temp.)-Bed Temp.-16-18⁰C, RH 80-85%, CO₂ – below 1000ppm

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

- i) Data to be recorded
- 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 7.5 with CaCO_3).
 - 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, 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 and ultimately the dry weight of the mushroom.
 - 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.

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: directordmr@gmail.com; shwetkamall@gmail.com.

Expt. 03: Evaluation of selected accessions of *Agaricus bisporus*

- | | |
|--|--|
| a) Participating centres | • Pune, Pantnagar, Solan, Ludhiana, Murthal (Pasteurized compost using wheat straw) |
| b) Substrate | <ul style="list-style-type: none"> • Substrate quantity- 10 kg compost/bag • No. of replications- 4 replications each with 5 bags of 10 kg compost/replicate for each strain in RBD. |
| c) Strains to be evaluated | • Short method compost (SSI-01, SSI-02, SSI-03, SSI-04, SSI-05, SSI-06, SSI-07, SSI-08, SSI-09, SSI-10) |
| d) Methodology to be adopted | • As given in Expt-2 |
| e) Spawning rate to be used | 0.7% of wet compost |
| f) Data to be recorded during 4 weeks cropping | As per format given in Expt-2 |
| g) Environmental conditions to be maintained inside cropping room | As given in Expt-2 |
| h) Bag size | 20"x24" (polythene - 150 gauge) |
| i) Data to be recorded | As given in Expt-2 |

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: directordmr@gmail.com; shwetkamall@gmail.com.

Expt. 04: Strain evaluation of Paddy Straw Mushroom, *Volvariella volvacea*

- a) Participating centres Faizabad, Coimbatore, Raipur, Ranchi, Samastipur, Bhubaneswar
*Cultures may be supplied to Passighat centre for initial evaluation
- b) Substrate 1.5% CaCO₃ mixed water soaked for 12-14 hours paddy straw bundles (45 cm × 15 cm)
- c) Method **Bundle method (5 bundles × 4 layers + 2 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**
- d) Strains Vv-01, Vv-09, Vv-11, Vv-12 and Vv-13
- 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: directordmr@gmail.com; shwetkamall@gmail.com; ahlawat22op@gmail.com

Expt. 05: Evaluation of high yielding varieties/strains of Oyster Mushroom (*Pleurotus* spp)

- a) Participating centres Raipur, Barapani, Faizabad, Ranchi, Vellayani, Bhubneswar, Samastipur, Hisar, Passighat, Udaipur, Nauni and Coimbatore
- b) Substrate
- Wheat straw or paddy straw
 - Substrate treatment: Chemical pasteurization (7.5 g Bavistin and 125 ml Formalin in 100 lt water)
 - 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 **Polybag (45x30cm)**
- d) Season for laying trials October – November
March – April
- e) Spawn rate 500g spawn for 5 kg dry substrate
- f) Varieties Six strains of *Pleurotus* (Coded as PL-11-01 to PL-11-06) will be provided by the Project Coordinator

- g) Data to be recorded
- 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.
 - 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
 - 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		

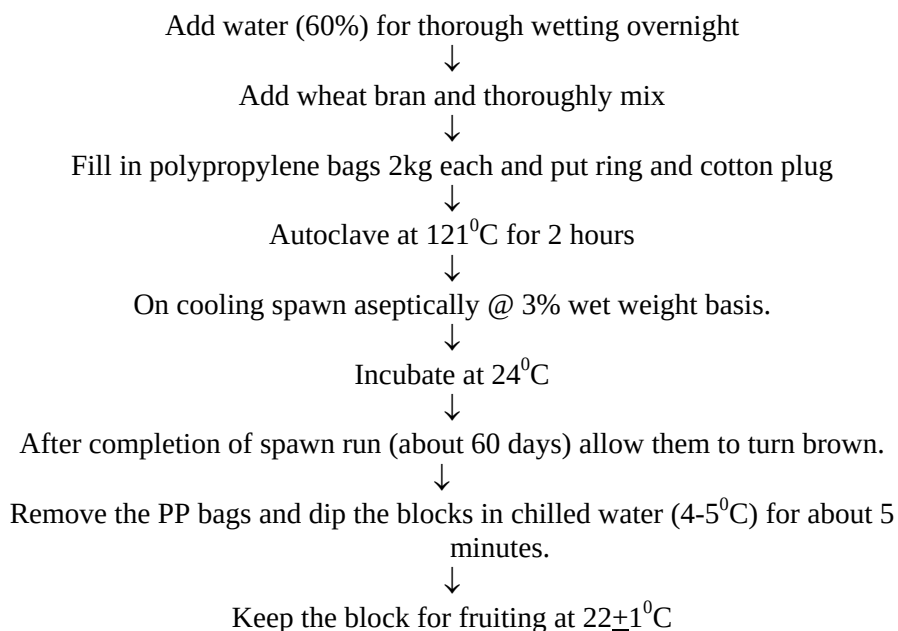
Table 2. Mushroom yield data

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: directordmr@gmail.com; shwetkamall@gmail.com; rc_upadhyay@hotmail.com.

Expt. 06: Evaluation of high yielding strains of Shiitake mushroom (*Lentinula edodes*)

- a) Participating centres Pantnagar, Coimbatore, Pune, Udaipur, Solan, Ludhiana, Passighat and Murthal
- b) Strain OE-16, OE-22, OE-28, OE-38, OE-388
- c) Substrate
- Saw dust (Broad leaved hard wood trees)
 - Wheat straw
- d) Supplement Wheat bran @ 20% dry weight basis
- e) Method of substrate preparation Autoclaving
- f) Spawn rate 3% on wet weight basis
- g) No. of replication 6 replications of 4 bags each (2kg/bag) in RBD design
- h) Observation to be recorded
- Time taken for primordial formation and total yield
 - Total number of fruit bodies
 - Average fruit body weight
- i) Production technology to be followed Take 40kg hard wood broad leaved trees' saw dust
↓



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: directordmr@gmail.com; shwetkamall@gmail.com; sharma_vp93@rediffmail.com.

II. CROP PRODUCTION

Expt. 07: To test role of heterotrophic bacterium *Alcaligenes faecalis* and conditioning after casing pasteurization in button mushroom yield stimulation

- | | |
|--|---|
| a) Participating centres | <ul style="list-style-type: none">• Short method compost: Pantnagar, Pune, Hisar and Murthal• Long method compost: Ludhiana, Faizabad, Udaipur and Samastipur |
| b) Strain to be used | <ul style="list-style-type: none">• U-3 |
| c) Substrate treatment | <ul style="list-style-type: none">• FYM + SC (1:1; v/v), both two years old well rotted + culture of <i>A. faecalis</i>• FYM + SC (1:1; v/v), both two years old well rotted• Spent compost (2 year old) + culture of <i>A. faecalis</i>• Spent compost (2 year old)• Coir pith + FYM (1:1; v/v) + culture of <i>A. faecalis</i>• Coir pith + FYM (1:1; v/v)• Coir pith + culture of <i>A. faecalis</i>• Coir pith <p>FYM and Spent compost to be used should be two years old and coir pith well decomposed and mixing of broth culture of bacterium containing 10^5 to 10^6 cells/ml at the time of casing</p> |
| d) Number of replications | Four replication with 3 bags of 10 kg compost/bag for each treatment |
| e) Design | RBD |
| f) Cost benefit ratio | |
| g) Brief Description of Methodology | Cultivation method same as for Expt. No. 1 |

- h) Data to be recorded**
- pH
 - Water holding capacity
 - Conductivity
 - Density
 - Quantitative enumeration of bacterial and fungal population
 - Yield (No. and weight of mushrooms).

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: directordmr@gmail.com; shwetkamall@gmail.com; ahlawat22op@gmail.com

Expt. 08: Total indoor compost production using thermophilic fungi

- a) Participating centres Murthal, Ludhiana, Pune, Pantnagar and Solan
One trial on farmer's field at Hoshiyarpur
- b) Substrate
- Wheat straw - 1000 kg
 - Poultry manure - 700 kg
 - Wheat bran - 70 kg
 - Urea - 12 kg
 - Gypsum - 40 kg
 - * Cold N level should be 1.6 to 1.75
- c) Inoculum
- Inoculum needed: *Scytalidium thermophilum* (X-21 strain) + *Humicola Insolens* (I-33) @ 0.4% on dry wt. basis of the straw i.e. 2.0 kg each
 - Inoculum has to be added at 2 stages
 - Culture will be provided by DMR, Solan
 - Inoculum to be grown on wheat grains (usual spawn bottles with sterilized wheat grain) and incubated at 45°C for 7-10 days
 - Later mix half of both the inoculum on a polythene sheet. Take two buckets of water and pour both the inoculum in it. Stir it properly with hands so that spores of fungi are distributed in water properly.
 - Inoculum solution is now ready.
- d) Method of compost preparation
- 0 day : Properly wet wheat straw and bring it up to 75% moisture level. Later thoroughly mix the ingredient in to it along with half of inoculum and make a heap of 4 ft height
 - +1 day: break open the heap, add water if required, mix the ingredients properly, again make a heap (temp around 58-60°C)
 - +2 day: Again turn the compost ingredient and make a heap (temp 62-65°C)
 - +3 day: Again turn the compost ingredient and make a heap (temp 70°C)
 - +4 day: Transfer the entire mass to phase-II tunnel after adding the left over half of the inoculum and equalize at 45-48°C)
 - +5 day: Maintain the compost temp at 45-52°C (pre-pasteurization conditioning)
 - +6 day: -do-
 - +7 day: Kill at 59°C for 6 h (either through self heat generation or through steam), later post pasteurization conditioning (POPC) at 48-52°C.
 - +8 day: Post pasteurization conditioning (POPC) continues
 - +9 days: POPC
 - +10 days: POPC and cool down at night
 - +11 day : Spawn
 - * Minimum 10% fresh air during entire operation even during killing
 - * Spawning can be done on 10th day if ammonia below 10 ppm
- e) Substrate quantity As in expt-2
- f) Spawn rate As in expt-2
- g) Strain to be used U-3

- h) Temperature for spawn run and cultivation As in expt-2
- i) Relative humidity As in expt-2
- j) No. of replication 16 replication of 10 bags each
- k) Control May be compared with average yield of U-3 in other trial for same cropping period (16 replications to be taken as control for CRD)
- l) Casing As in expt-2
- m) Observation to be recorded:
- Physical parameter of compost like pH, Nitrogen, Moisture etc
 - Quantity of total compost produced
 - Days required to complete phase-II
 - Yield per 100 kg compost
 - Time (days) taken for spawn run
 - Time (days) taken for case run
 - Time (days) taken for primordial formation
 - Total No. of fruit bodies/bag
 - Total mushroom yield/bag
 - Fruit body weight
 - Disease incidence
- n) Cost benefit ratio

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: directordmr@gmail.com; shwetkamall@gmail.com; bvijay2@hotmail.com.

Expt. 09 Evaluation of the cultivation technology of *Macrocybe giganteum*

- a) Participating centres Udaipur, Murthal, Bhubaneshwar, Raipur, Pune, Samastipur, and Solan
- b) Season for cultivation September to October and April to June
- c) Substrate
- i) Wheat straw
 - ii) Paddy straw
 - iii) Wheat and paddy straw 1:1
- * Substrate is to supplemented with 1 kg lime/100kg dry straw after wetting
- d) Method of substrate preparation
- i) Autoclaving at 22 p.s.i. for 60 minutes
 - ii) Outdoor composting for 9 days (minimum 3 quintal straw)
- Wet wheat or chopped paddy straw and mix 1% lime on the basis of dry weight of the substrate. Prepare a pile of 100-110 cm high and same width. Turn the pile on 3rd and 6th day. On 9th day break open the pile and cool down then spawn.
- e) Substrate quantity 2 kg /bag wet wt. basis
- f) Spawn rate 1 kg spawn for 20 kg wet wt. of straw
- g) Temperature for spawn run and cultivation 28-35°C
- h) Light 100 lux for 6-8 h
- i) Relative humidity 70-80%
- j) No. of replication 5 replications each with 10 bags in RBD
- k) Casing Garden soil + sand (1:1 v/v) treated with 2% formaldehyde for 48 h. Casing depth – 3 cms

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- l) Observation to be recorded separately for wheat, paddy straw and combination
- Substrate Moisture
 - Substrate Nitrogen
 - Substrate pH
 - Temperature and RH during cropping
 - Time (days) taken for spawn run
 - Time (days) taken for primordial formation
 - Total No. of fruit bodies/bag
 - Total mushroom yield/bag
 - Storage at room temperature
- m) Cost benefit ratio

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: directordmr@gmail.com; shwetkamall@gmail.com; rc_upadhyay@hotmail.com.

IV. EXTENSION 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 packets

4. RESEARCH PROGRESS

1. CROP IMPROVEMENT

1.1 Testing of different strains of white button mushroom *Agaricus bisporus*

This experiment was conducted in two sets (i) on long method-unpasteurized compost and (ii) on short method pasteurized compost. The experiment was assigned to different centres separately on long and short method compost and also the strains to be tested were different for long and short method compost. Udaipur, Ludhiana, Faizabad, Hisar, and Samastipur centres were assigned the experiment to evaluate the strains on long method compost while Pune, Pantnagar, Solan, Nauni, and Murthal on short method compost. The sample size of the experiment was six bags of 10 kg compost each in one replication and the experiment was replicated four times. The parameters of compost i.e. pH, Nitrogen, moisture and colour were also recorded.

In trials conducted using the long method compost, the maximum yield of 16.80 kg per 100 kg of compost was recorded in the strain U-3 at Pusa (Samastipur) Centre followed by strain NCS-100 at the same centre. The strain NCS-101 also performed equally well at Hisar centre with a yield of 15.4 kg per 100 kg compost. The lowest yield was recorded in strain A-15 at Ludhiana centre. Overall best average productivity was recorded in NCS-100 followed by U-3 (12.69 kg) and NCS-101 (12.63 kg per 100 kg compost) on all the centres (Table 4.1).



Fig.4.1 U-3 strain in fruiting at Pusa Centre

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

<i>A. bisporus</i> strain	Mushroom yield (kg/100kg compost) at different centres						
	Udaipur	Ludhiana	Faizabad	Pusa	Hisar	Solan	Average
NCS-100	11.05	14.46	9.14	15.48	14.8	15.27	13.37
NCS-101	10.79	13.51	10.62	13.30	15.4	12.18	12.63
S-11	10.34	13.50	10.94	12.33	12.6	13.32	12.17
U-3	8.58	13.82	11.97	16.80	10.5	14.48	12.69
A-15	8.68	5.71	13.47	11.66	11.8	13.65	10.83
S-130	9.51	9.24	11.55	10.33	12.3	14.72	11.28
Bel-1	10.53	9.30	8.37	8.00	13.7	11.26	10.19
Bel-2	10.08	12.79	8.71	7.42	12.5	10.68	10.36
CD (0.05)	0.89	0.75?	1.20	1.35	1.20	1.61	-

The compost parameters recorded at various centres have clearly indicated that the pH of the compost ranged from 7.2 to 7.8 while nitrogen percent was varied from 1.5 to 2.2. The moisture percent was 65-70% (Table 4.2). 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 4.2 Compost parameters for long method compost

Centres	pH	Nitrogen (%)	Moisture (%)	Colour
Udaipur	--	--	--	--
Ludhiana	7.3	2.2	68	Dark brown
Faizabad	7.3	1.5	69	Dark brown
Pusa	--	--	--	--
Hisar	7.2	1.6	70	Dark brown
Solan	7.8	1.6	65	Dark brown

In another set of experiment on evaluation of *A. bisporus* strain using short method of compost, maximum yield of 22.23kg /100 kg of compost was recorded in the strain NCH-102 at Pantnagar centre followed by strain Bel-2 at the same centre (20.63 kg). The minimum yield of 7.8 kg/100 kg compost was recorded in strain Bel-2 at Murthal centre. At DMR Solan, the best performing strain was observed to be U-3 with an average yield of 19.48 kg /100 kg compost. The strains

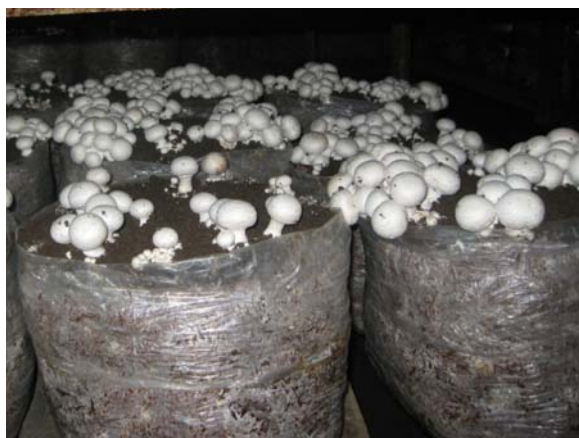


Fig. 4.3 Button mushroom crop at Solan

Bel-2 and NCH-102 performed equally well



Fig4.2 Strain Bel-1 in Fruiting at Nauni

at DMR. At Murthal centre also the best performing strain was observed to be the NCH-102 with an average yield of 16.3 kg /100 kg compost. Overall average of all the strains at all the centres showed that S-130 (Evaluated by only 3 out of 5 centres) followed by NCH-102 and Bel-1 with an average yield of 16.85, 15.63 and 15.52 kg were the performing strain in all the conditions (Fig 4.2). However, all other strains performed well and were found at par with each other (Table 4.3).

Table 4.3 Yield of different strains of white button mushroom on short method compost in four weeks cropping

<i>A. bisporus</i> strain	Mushroom yield (kg/100kg compost) at different centres					
	Pune	Pantnagar	Murthal	Nauni	Solan	Average
NCH-102	11.75	22.23	16.3	10.81	17.06	15.63
U-3	17.45	17.38	10.9	9.56	19.48	14.95
Bel-1	12.30	18.73	14.0	17.23	15.33	15.52
Bel-2	15.70	20.63	7.8	9.71	18.87	14.54
Delta	14.80	15.90	12.4	13.40	16.31	14.56
A-17	12.70	19.70	12.0	13.96	15.48	14.77
S-130	15.40	18.53	--	--	16.62	16.85
S-454	16.25	13.40	11.5	--	16.74	14.47
CD (0.05)	1.96	1.79	1.82	2.62	2.12	--

The analysis of the compost at different centres showed that all the parameters varied in a narrow range like pH (7.1-7.9), nitrogen (1.7-2.1%) and moisture (62-69%) (Table 4.4).

Table 4.4 Compost parameters for short method compost

Centres	pH	Nitrogen %	Moisture (%)	Colour
Pune	7.4	2.1	67	Dark Brown
Pantnagar	7.1	2.1	69	Dark brown
Murthal	7.9	1.7	62	Dark brown
Nauni	--	--	--	--
Solan	7.4	1.61	62.4	Dark brown

The time taken in first harvest (days post casing) when crop is raised using long method compost was in the range of 15 to 27 days. The first harvest time was recorded at Udaipur centre followed by Pusa centre in all the strains. The minimum 15 days time was recorded in strains NCS-100, S-11, A-15 and S-130 at Udaipur centre

followed by NCS-101 and Bel-1 strains 16 days each. At Pusa Centre the time taken for first harvest ranged from 18 -21 days while at all the other centres including DMR, Solan, the days taken for first harvest were more than 21 days (Table.5). Overall average showed the minimum time taken for first harvest was 20.2 days in the strain NCS-100.

Average fruit body weight also varied at different centres and was recorded maximum (17g) at Faizabad centre in the strain U-3 and Bel-2 followed by NCS-101 and Bel-1. The maximum fruit body weight recorded at Ludhiana centre was 13.7 g in strain U-3 closely followed by strain S-11 (13.6 g). At Udaipur centre, the maximum fruit body weight was recorded to be 13.4 g in the strain NCS-100 followed by NCS-101 (12.7 g). The overall average shows the maximum fruit body weight in the strains NCS-101 and Bel-2 indicating good quality fruit body (Fig 4.3) in all the climatic conditions (Table 4.5).

Table 4.5. Time taken to first harvest and average fruit body weight in *A. bisporus* strains on long method compost

<i>A. bisporus</i> strain	Time taken for first harvest (days post casing) and fruit body wt (g)											
	Pusa		Ludhiana		Faizabad		Udaipur		Solan		Average	
	a	b	a	b	a	b	a	b	a	b	a	b
NCS-100	18	--	24	11.8	23.0	15	15	13.4	21	10.5	20.2	12.7
NCS-101	20	--	26	13.0	24.2	16	16	12.7	24	11.1	22.0	13.2
S-11	21	--	25	13.6	24.2	15	15	11.1	26	11.3	22.2	12.8
U-3	20	--	27	13.7	24.0	17	17	9.5	27	11.3	23.0	12.9
A-15	18	--	27	12.8*	24.0	15	15	9.7	27	10.2	22.2	11.9
S-130	20	--	25	13.5*	22.5	15	15	10.4	20	10.8	20.5	12.4
Bel-1	19	--	25	12.7	24.0	16	16	10.7	18	11.2	20.4	12.7
Bel-2	20	--	27	13.2*	23.5	17	17	11.5	18	11.2	21.1	13.2
CD (0.05)	1.7	--	1.3	0.62	1.41	0.76	1.21	2.4	2.26	0.81	--	--

a. First harvest (days post casing); b. average fruit body wt (g); * disease/pest encountered

The time taken for first harvest when crop is raised using steam-pasteurized compost was minimum 17 days post casing in strain NCH-102 at Pantnagar Centre followed by 18 days in the same strain and strain U-3 at Solan and Pune centres, respectively. The maximum time taken for first harvest was 28 days in strain Bel-1 and S-454 at Solan centre. The overall average of all the centres showed the minimum time taken for first harvest was 19.8 days in strain U-3 while maximum time was recorded in strain S-454 followed by Bel-1.



Fig 4.4 Quality of fruit body in different strains; a-U-3; b-Bel2; c-S11

The average fruit body weight ranged from 10.2 to 16.4 g with maximum in strain U-3 at Pune centre followed by Bel-2, S-454 and Delta at the same centre. At Pantnagar centre the maximum fruit body weight recorded was 14.6 in the strain NCH-102 and minimum of 10.4 g in strain S-454 while at Murthal centre maximum fruit body weight was recorded to be 14.5 g in Bel-1 strain. At Nauni centre the maximum fruit body weight was recorded to be 14.5 in Bel-1 strain. Overall average of the fruit body weight showed maximum 14.0

g in strain S-130 followed by 13.8 g in strain U-3 while the minimum fruit body weight was 11.5 g in strain A-17. Quality of fruit body in general was good in all the strains of *A. bisporus* (Table 4.6).

Table 4.6 Time to first harvest and average fruit body weight of *A. bisporus* strains on short method compost

<i>A. bisporus</i> strain	Time taken for first harvest (days post casing) and fruit body wt (g)											
	Pune		Pantnagar		Murthal		Nauni		Solan		Average	
	a	b	a	b	a	b	a	b	a	b	a	b
NCH-102	21	14.3	17	14.6	24	12.5	24	12.5	18	10.2	20.8	12.8
U-3	18	16.4	22	13.1	20	13.5	20	13.5	19	12.4	19.8	13.8
Bel-1	22	14.7	20	13.8	20	14.5	20	14.5	28	11.1	22.0	13.7
Bel-2	21	15.8	18	14.1	22	13.0	22	13.0	24	10.3	21.4	13.2
Delta	20	15.4	22	12.2	21	11.5	21	11.5	21	12.2	21.0	12.6
A-17	22	12.2	18	13.9	21	10.5	21	10.5	21	10.5	20.6	11.5
S-130	21	15.3	20	13.4	--	--	--	--	19	13.4	20.0	14.0
S-454	19	15.7	22	10.4	--	--	--	--	28	11.5	23.0	12.5
CD (0.05)	1.6	2.6	1.3	1.8	2.2	0.6	1.4	0.8	1.6	1.2	--	--

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

1.2. Evaluation of selected accessions of *Agaricus bisporus*

This experiment was planned for multilocation trials of newly developed accession of *A. bisporus*. The accessions comprised of five white and five brown high yielding strains of button mushroom. The accessions were evaluated on short method pasteurized compost. The experiment was assigned to centres, Pune, Pantnagar, Nauni, Solan, Ludhiana and Murthal (Fig 4.5). The sample size of the experiment was six bags of 10 kg compost each in one replication and the experiment was replicated four times. The parameters of compost i.e. pH, Nitrogen, moisture and colour were also recorded.



Fig. 4.5 *A. bisporus* selections growing at Nauni Centre

Evaluation of selected accessions of white strains using short method of compost, maximum yield of 22.8 kg /100 kg of compost was recorded in the SSI-3 at Murthal centre closely followed by SSI-2 at Pantnagar centre (22.65kg). The strain SSI-2 yielded at par with SSI-3 at Murthal centre with a yield of 21.8 kg/100 kg compost. The minimum yield of 7.3 kg/100 kg compost was recorded in white strain control at Murthal centre. At DMR Solan, the best performing strain was observed to be SSI-4 with an average yield of 20.03kg /100 kg compost closely followed by SSI-1 (18.60 kg). Overall average of all the strains at all the centres showed that all the selections have performed well over the control with maximum yield of 17.85 kg in SSI-2 (Table.7).

SSI-6 to SSI-9 was of brown type with SSI-10 as control. Evaluation of the brown strains showed the maximum yield of 25 kg /100 kg compost in SSI-6 at Murthal centre closed followed with SSI-7 with yield of

23.18 kg at Nauni centre. At Pantnagar centre also all the brown strain performed well over check with a maximum yield of 20.77 kg /100 kg compost in SSI-6. Overall average of all the centres showed that all the four strain performed better than control with a maximum average of 19.35 kg in SSI-6 (Table.7).

Table 4.7 Yiled data of selected accessions of white button mushroom

A. bisporus strain	Mushroom yield (kg/100kg compost) at different centres					
	Murthal	Nauni	Pantnagar	Pune	Solan	Average
SSI-1	7.6	12.27	17.60	13.15	18.60	13.84
SSI-2	21.8	13.86	22.65	14.45	16.48	17.85
SSI-3	22.8	13.80	16.40	13.44	16.16	16.52
SSI-4	11.7	--	17.42	13.56	20.03	15.68
SSI-5 (Control)	7.3	--	18.57	14.22	14.00	13.52
SSI-6	25.0	18.33	20.77	15.52	17.13	19.35
SSI-7	--	23.18	16.77	13.10	15.50	17.14
SSI-8	--	15.22	21.45	12.38	19.16	17.05
SSI-9	--	14.15	19.70	14.12	15.36	15.83
SSI-10 (Control)	--	15.39	16.15	13.78	13.96	14.82
CD (0.05)	2.48	3.62	2.30	1.92	2.62	--

The accessions were also assessed for their first harvest time and average fruit body weight for the assessment of quality of the fruit body. Amongst white strain the quickest time for first harvest was recorded as 13 days post casing in SSI-3 at Murthal centre. Although at all the other centres the first harvest time ranged between 17 to 28 days. The quickest first harvest time was recorded at Murthal centre in all the accessions. The maximum first harvest time of 28 days was recoded at DMR, Solan centre in control. All the accession took lesser time of first harvest than control at Solan centre. Amongst brown strains also the quickest first harvest time of 14 days was recorded at Murthal centre in SSI-6 while maximum of 28 days in again the control i.e. SSI-10 at Solan centre. The quality parameters of the all the strains were also evaluated in terms of average fruitbody weight. Amongst white strains the maximum fruit body weight of 15.90 g was recorded in SSI-3 followed by SSI-2 (15.33g) at Solan centre. Good fruit body weight was also recorded at Pune Centre in almost all the strains with a maximum of 15.3g in SSI-4 and SSI-1. Amongst brown strain, the maximum fruit body weight was recorded to be 15.6 g in Brown strain control at Pune centre. It is also reported that SSI-7 and SSI-8 had a good fruitbody while rest are light in weight and opens quickly. Overall, the fruit body weight in brown strains was found to be lower than in white strains (Fig. 4.6 and Table 4.8).

Table 4.8 Time taken for first harvest and fruit body weight in selected accessions of button mushroom

A. bisporus strain	Time taken for first harvest (days post casing) and fruit body wt (g)											
	Murthal		Nauni		Pantnagar		Pune		Solan		Average	
	a	b	a	b	a	b	a	b	a	b	a	b
SSI-1	15	13.1	22	9.0	22	14.1	21	15.3	20	14.1	20.0	13.1
SSI-2	16	14.4	23	9.2	17	13.4	22	14.2	22	15.3	20.0	13.3
SSI-3	13	13.0	22	12.0	23	14.4	20	13.2	22	15.9	20.0	13.7
SSI-4	14	14.1	--	--	21	14.0	21	15.3	18	11.9	18.5	13.8
SSI-5 (Control)	16	15.3	22	10.0	21	13.5	20	14.3	28	12.9	21.4	13.2
SSI-6	14	9.9	22	11.0	17	13.1	19	17.3	23	14.3	19.0	13.1
SSI-7	--	--	21	12.7	21	12.3	20	15.3	20	9.7	20.5	12.5
SSI-8	--	--	21	9.5	18	13.4	21	16.4	24	12.6	21.0	13.0
SSI-9	--	--	21	10.7	20	13.0	20	14.2	22	12.7	20.8	12.7
SSI-10(Control)	--	--	21	11.0	22	14.6	21	15.6	28	13.9	23.0	13.8
CD (0.05)	1.2	0.6	0.2	0.5	1.3	0.8	0.6	1.2	1.6	0.5	--	--

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

Fig. 4.6 Fruit body Quality in selected accessions of *A. bisporus*

1.3 Strain evaluation of Paddy Straw Mushroom, *Volvariella volvacea*

The trial was assigned at six centres and a total of five strains of *Volvariella volvacea* were tested. The biological efficiency of various strains varied in the range of 1.75 to 25.8 kg /100 kg of dry substrate at various centres in different strains. The maximum biological efficiency of 25.8kg/100 kg of dry substrate was recorded in strain Vv-01 at Coimbatore centre followed by 18.8 kg in strain Vv-12 at the same centre (Fig 4.7). It was also recorded that the maximum biological efficiency for all the test strain was achieved at the Coimbatore centre. Good biological efficiency was also recorded at Bhubaneswar centre with a maximum of 16.10 g /100 kg straw in the strain Vv-11 (Fig 4.8). The minimum biological efficiency was recorded in Vv-09 at Solan centre with an average yield of 1.75 kg /100 kg of dry substrate. Low biological efficiency was also recorded at Raipur centre. At Faizabad centre the maximum BE was obtained in strain Vv-11 (8.20 kg) and a minimum of 6.15 kg was recorded in strain Vv-13. The overall average showed that the maximum BE (12.32 kg) was recorded in Vv-01 strain while the minimum BE (9.22 kg) was in strain Vv-09 (Table 4.9).



Fig. 4.7 Paddy straw mushroom crop at Coimbatore

Table. 4.9. Yield of different strains of Paddy Straw Mushroom, *Volvariella volvacea*

Strain	Mushroom yield (kg/100kg dry substrate)						
	Faizabad	Coimbatore	Raipur	Ranchi	Bhubaneswar	Solan	Average
Vv-01	6.75	25.8	4.03	--	4.03	8.93	11.64
Vv-09	7.30	15.6	6.74	--	6.74	7.75	10.42
Vv-11	8.20	17.5	9.30	--	9.30	7.51	11.72
Vv-12	7.99	18.8	3.56	--	3.56	1.75	9.23
Vv-13	6.15	18.5	2.52	--	2.52	--	9.87
CD(0.05)	0.59	1.62	0.99	--	0.99	1.26	--

Table 4.10 Average fruit body weight (g) and time taken to first harvest in strains of paddy straw mushroom

Strain	Average fruit body weight (g) and time taken for first harvest (days)											
	Faizabad		Coimbatore		Raipur		Bhubaneswar		Solan		Average	
	a	b	a	b	a	b	a	b	a	b	a	b
Vv-01	8.1	12	22.8	10.0	-	16	13.8	16	14.8	12.6	14.9	13.3
Vv-09	9.5	12	20.8	12.6	-	14	13.3	15	8.1	13.9	12.9	13.5
Vv-11	13.8	13	21.2	11.0	-	13	15.2	13	7.8	13.3	14.5	12.7
Vv-12	11.7	12	22.7	12.0	-	15	16.2	17	10.3	15.0	15.2	14.2
Vv-13	11.5	12	23.1	13.0	-	16	16.1	16	--	--	16.9	14.3
CD (0.005)	1.0	0.2	1.2	0.6	-	1.1	0.5	0.8	1.6	1.36	--	--

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

The average fruit body weight varied at different centres with a maximum of 23.1g at Coimbatore centre in the strain Vv-13 while the minimum fruit body weight was recorded to be 7.8g at Solan centre in the strain Vv-11. All the strains have recorded the maximum fruit body weight at Coimbatore centre followed by Bhubaneshwar centre. The maximum fruit body weight recorded at Bhubaneshwar centre was 16.2g in strain Vv-12. At Faizabad centre the maximum fruit body weight (13.8g) was recorded in strain Vv-11 while minimum was 8.1g in Vv-01. Overall average showed that the maximum fruit body weight (16.4g) was recorded in strain Vv-13 while minimum (13.5 g) in Vv-09 strain.

The minimum time taken for the first harvest was 10 days in strain Vv-01 at Coimbatore centre and 11 days in strain Vv-11 at the same centre. The overall average also indicated the minimum time taken for the first harvest was in strain Vv-11 while the maximum time in strain Vv-12 (Table 4.10).



Fig 4.8 Paddy straw mushroom crop at Bhaubaneshwar

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

This trial was conducted at 12 different centres. A total of six high yielding strains of *Pleurotus* species were under evaluation trial. The maximum yield of 104.2kg /100 kg of dry substrate was obtained in strain Pl-11-02 at Ranchi Centre followed by strain Pl-11-01 at Coimbatore centre. At Raipur, Barapani, Bhubaneshwar, and Solan centres the best performer strain was Pl-11-03 with 75.7, 74.0, 86.1 and 81.0 kg mushroom per 100 kg straw, respectively (Fig.4.9) while at Vellayani, Samastipur and Ranchi centres, the best performer strain was Pl-11-06 (Fig 4.10). At Faizabad, Udaipur and Nauni centres strains Pl-11-05, Pl-11-02, and Pl-11-01 performed well, respectively. Cumulative average of the yield showed that Pl-11-02, Pl-11-03 and Pl-11-04 performed equally well (Table 4.11).



Fig 4.9 High yielding Oyster variety under fruiting at Raipur

Table 4.11. Strain evaluation of oyster mushroom species

Strain/ Hybrid	Mushroom yield (kg/100kg of dry substrate)												
	Raipur	Bara pani	Coim batore	Faiza bad	Vella yani	Bhubn eswar	Pusa	Hisar	Ranchi	Udai pur	Nauni	Solan	Avera ge
Pl-11-01	55.4	52.4	99	69.2	46.1	72.3	85.7	59.0	39.7	84.7	43.1	63	64.13
Pl-11-02	54.9	73.0	84	61.1	33.0	76.4	68.9	67.4	104.2	94.6	33.4	63	67.83
Pl-11-03	75.7	74.0	87	74.4	56.6	86.1	82.5	60.1	28.8	70.2	25.7	81	66.84
Pl-11-04	61.9	64.4	83	73.5	63.8	73.4	78.3	72.1	60.7	78.9	29.1	60	66.59
Pl-11-05	49.0	38.5	80	77.4	78.6	84.5	81.6	62.7	29.4	63.3	38.1	40	60.26
Pl-11-06	56.0	30.8	60	72.8	93.4	69.2	92.3	61.4	68.0	84.7	39.2	33	63.40
CD 5%	6.2	9.7	8.2	5.8	10.6	9.1	3.2	2.8	12.6	2.8	4.2	8.82	--

The minimum time of 19 days for first harvest of the crop was recorded in strain Pl-11-02, Pl-11-04 at Raipur centre and Pl-11-05 at Bhubaneswar centre. The maximum time taken was 51.6 days in strain Pl-11-04 at Barapani centre. At all the other centre, the time taken for first harvest ranged in 30-40 days. The overall average of all the centres showed the time taken in first harvest ranged between 31 to 35 days in all the strains (Table 4.12).

Average fruit body weight of all the strains at different centre ranged between 4.8 to 19.4 g. The maximum fruit body weight of 19.4 g was recorded in Pl-11-03 strain at Barapani centre while the minimum of 4.8 g was recorded in Pl-11-01 strain at Coimbatore centre. Overall average showed the maximum fruit body weight of 10.0 g in strain Pl-11-03 and the lowest of 7.9 g in Pl-11-06 strain (Table 4.13).



Fig 4.10 High yielding Oyster variety under fruiting at Pusa

Table 4.12 Time taken for first harvest in different strains of *Pleurotus*

Strain/ Hybrid	Time taken for first harvest (Days post spawning)												
	Raipur	Barapani	Coimbatore	Faizabad	Bhubaneswar	Samaipur	Hisar	Ranchi	Udaipur	Nauni	Vellayani	Solan	Average
Pl-11-01	21	42.7	33.0	36	29	30	35.4	36	39	33	32	30	33.1
Pl-11-02	19	44.4	32.0	34	32	28	36.0	23	47	33	37	30	33.0
Pl-11-03	21	42.1	28.0	30	31	32	33.0	39	43	31	30	28	32.3
Pl-11-04	19	51.6	32.0	36	36	25	39.4	39	46	34	32	34	35.3
Pl-11-05	20	28.1	28.0	34	19	27	36.0	35	36	30	39	38	30.8
Pl-11-06	24	35.0	30.0	30	23	22	34.0	35	44	30	33	36	31.3
CD 5%	1.6	2.8	--	--	1.2	2.1	1.4	1.3	--	1.2	--	--	--

Table 4.13 Average fruit body weight in different strains of *Pleurotus*

Strain/ Hybrid	Average fruit body weight (g)							
	Raipur	Barapani	Coimbatore	Faizabad	Bhubaneswar	Udaipur	Solan	Average
Pl-11-01	13.00	9.331	4.8	9.53	7.85	5.51	10.3	8.6
Pl-11-02	9.48	10.178	6.5	10.01	8.91	5.18	9.5	8.5
Pl-11-03	12.50	19.401	5.2	8.48	6.73	5.78	12.1	10.0
Pl-11-04	10.71	12.463	4.9	8.92	10.71	6.47	9.7	9.1
Pl-11-05	6.70	14.625	5.5	9.77	8.51	8.06	10.2	9.1
Pl-11-06	8.70	11.738	5.0	9.70	6.29	5.20	8.8	7.9
CD 5%	--	--	--	--	0.954	--	--	--

1.5. Evaluation of high yielding strains of Shiitake mushroom (*Lentinula edodes*)

This trial was conducted at eight different centres viz., Pantnagar, Coimbatore, Pune, Udaipur, Solan, Ludhiana, Passighat and Murthal. A total of five high yielding strains of *Lentinula edodes* were under evaluation trial. At two centres viz., Pune and Murthal, the experiment is under progress and results are not submitted yet. At Udaipur, Pantnagar and Solan centres, the experiment was conducted on Sawdust and Wheat straw both supplemented with 20% wheat bran while at Ludhiana and Coimbatore, the experiment was conducted on wheat straw supplemented with 20% wheat bran. At



Fig. 4.11 Shiitake crop at Udaipur

Udaipur and Pantnagar centres, higher yields were obtained on wheat straw while at Solan higher yields were recorded on sawdust substrate. The maximum yield of 53.64kg /100 kg of dry substrate was obtained in strain OE-388 at solan centre followed by OE-38 with a yield of 47.39 kg on sawdust substrate. The minimum yield on sawdust substrate was obtained in strain OE-22 at Udaipur centre (Fig 4.11). The maximum yield on wheat straw substrate was recorded 45.00kg /100 kg dry substrate in strain OE-16 at Coimbatore centre followed by OE-22 at the same centre. Overall average yield at all the centres showed that the strain OE-388 performed the best both on sawdust and wheat straw based substrate with an average yield of 29.35 and 30.66, respectively (Table 4.14).

Table 4.14 Strain evaluation of Shiitake mushroom

Strain/ Hybrid	Mushroom yield (kg/100kg of dry wheat straw)							
	Udaipur	Pune	Pantnagar	Murthal	Ludhiana	Coimbatore	Solan	Average
OE-16 (SD+WB)	8.91	Cont.	11.53	Cont.	--	--	45.31	21.92
OE-16 (WS+WB)	27.43	Cont.	12.63	Cont.	20.5	45	32.30	27.57
OE-22 (SD+WB)	5.12	Cont.	16.03	Cont.	--	--	36.97	19.37
OE-22 (WS+WB)	26.59	Cont.	17.25	Cont.	34.3	42	10.33	26.09
OE-28 (SD+WB)	6.41	Cont.	8.95	Cont.	--	--	11.45	8.94
OE-28 (WS+WB)	30.97	Cont.	10.38	Cont.	27.8	40	9.67	23.76
OE-38 (SD+WB)	8.04	Cont.	12.70	Cont.	--	--	47.39	22.71
OE-38 (WS+WB)	36.79	Cont.	13.63	Cont.	19.1	38	18.20	25.14
OE-388 (SD+WB)	8.52	Cont.	25.88	Cont.	--	--	53.64	29.35
OE-388 (WS+WB)	39.85	Cont.	30.85	Cont.	22.3	32	28.30	30.66
CD 5%	19.87		3.56		3.4	3.1	8.24	--

Average fruit body weight of all the strains at different centre ranged from 11.05 to 81.25g. The maximum fruit body weight of 81.25g was recorded in OE-16 strain at Solan centre while the minimum of 11.05 g was recorded in strain OE-28 at Udaipur centre. Overall average showed the maximum fruit body weight of 51.18 g in strain OE-16 and the lowest of 20.53 g in strain OE-38 (Table 4.15).

Table 4.15 Average fruit body weight in different strains of Shiitake

Strain/ Hybrid	Average fruit body weight (g)							
	Udaipur	Pune	Pantnagar	Murthal	Ludhiana	Coimbatore	Solan	Average
OE-16 (WS+WB)	14.85	Cont.	14.60	Cont.	20.1	32.4	56.66	27.72
OE-16 (SD+WB)	21.1	Cont.	--	Cont.	--	--	81.25	51.18
OE-22 (WS+WB)	11.37	Cont.	17.85	Cont.	32.1	28.3	28.75	23.67
OE-22 (SD+WB)	16.82	Cont.	--	Cont.	--	--	76.00	46.41
OE-28 (WS+WB)	11.05	Cont.	12.64	Cont.	25.6	30.2	57.11	27.32
OE-28 (SD+WB)	18.32	Cont.	--	Cont.	--	--	32.85	25.59
OE-38 (WS+WB)	14.61	Cont.	15.53	Cont.	17.3	31.2	24.00	20.53
OE-38 (SD+WB)	23.13	Cont.	--	Cont.	--	--	43.75	33.44
OE-388 (WS+WB)	13.52	Cont.	30.79	Cont.	18.1	24.6	39.52	25.31
OE-388 (SD+WB)	25.70	Cont.	--	Cont.	--	--	63.57	44.64
CD 5%	--	--	--	--	--	--	--	--

2. CROP PRODUCTION

2.1 To test role of heterotrophic bacterium *Alcaligenes faecalis* and conditioning after casing pasteurization in button mushroom yield stimulation

The trial was assigned to eight different centres i.e. Ludhiana, Faizabad, Udaipur, Samastipur, Pantnagar, Pune, Hisar and Murthal. Eight different treatments were tested which included FYM, Spent mushroom substrate and coir pith alone and in combination. The bacterial inoculations were also tested for probable yield enhancement in button mushroom. Significant yield enhancement was recorded at Pantnagar, Pune, Pusa, Udaipur and Solan centre by inoculating the bacterium *Alcaligenes faecalis* in all the casing mixtures but the maximum yield of 22.85kg / 100 kg of compost was obtained in the casing mixture made up of FYM + Spent compost + bacterium at Pantnagar centre. At Ludhiana centre, yield enhancement was noticed by bacterial inoculation but in the casing mixture composed of FYM+SC and Coir pith + FYM. In other treatments at Ludhiana instead of yield enhancement, a decrease in yield was recorded. At Faizabad centre also same trend was noticed. However at Pune centre yield enhancement was noticed. Overall average showed yield enhancement by inoculation of bacterium *Alcaligenes faecalis* (Table 4.16).



Fig. 4.12 Expt on bacterial inoculation at Pune

Table 4.16. Effect of bacterium *Alcaligenes faecalis* on yield of white button mushroom

Casing treatments	Mushroom yield kg/100 kg compost from 6 weeks of cropping								
	Ludhiana	Faizabad	Udaipur	Pantnagar	Pune	Hisar	Pusa*	Solan	Average
FYM + SC (1:1; v/v), both two years old well rotted + <i>A. faecalis</i>	12.08	5.50	12.77	22.85	17.80	12.5	12.25	20.30	14.51
FYM + SC (1:1; v/v), both two years old well rotted	11.56	7.27	11.38	19.94	16.95	--	11.45	18.76	13.90
Spent compost (2 year old) + culture of <i>A. faecalis</i>	9.40	7.40	14.48	21.30	19.65	12.8	13.75	19.62	14.80
Spent compost (2 year old)	5.64	6.18	13.10	19.68	17.10	--	10.75	16.74	12.74
Coir pith + FYM (1:1; v/v) + culture of <i>A. faecalis</i>	5.00	10.52	14.28	18.60	17.84	--	16.60	11.94	13.54
Coir pith + FYM (1:1; v/v)	2.36	8.47	12.75	15.93	17.50	--	15.63	12.23	12.12
Coir pith + culture of <i>A. faecalis</i>	4.16	5.93	12.98	16.83	18.55	--	14.20	14.90	12.51
Coir pith	5.06	5.62	11.63	15.48	16.87	--	13.70	10.42	11.25
CD (0.05)	0.73	0.79	0.55	1.91	0.68	--	1.822	1.56	

The time taken in first harvest (days post casing) was recorded to be the minimum of 18.7 days in FYM+spent compost without bacterial inoculation at Solan centre while the maximum time of 30 days was recorded in all the treatment at Ludhiana centre. The maximum time taken for first harvest at Solan centre was recorded to 21.8 days in Coir pith alone treatment. At Ludhiana Centre no decrease in time to first harvest was recorded due to bacterial inoculations. At other centres also there was a maximum of one day early first harvest was recorded. Overall average of all centre showed no significant reduction in time taken to first harvest. On the other hand, average fruit body weight was recorded to be the maximum 23.4 g in FYM+spent compost without

bacteria at Faizabad centre while the minimum (2.78 g) was in Coirpith + FYM at Pantnagar centre. The average fruit body weight varied at different centre and no correlation could be found with the casing material and treatment (Table 4.17).

Table 4.17 Effect of bacterium *Alcaligenes faecalis* on time taken for first harvest and average fruit body weight

Casing treatments	Time taken for first harvest (days) and average fruit body weight (g)											
	Ludhiana		Faizabad		Udaipur		Pant nagar	Pusa	Solan		Average	
	a	b	a	b	a	b		a	a	b	a	b
FYM + SC (1:1; v/v), both two years old well rotted + <i>A. faecalis</i>	30	13.8	24.0	22.4	20	13.9	13.9	28	20.0	12.6	24.4	15.3
FYM + SC (1:1; v/v), both two years old well rotted	30	10.8	25.0	23.4	21	11.3	14.6	28	18.7	12.6	24.5	14.5
Spent compost (2 year old) + culture of <i>A. faecalis</i>	30	11.5	26.0	21.4	21	13.6	14.5	25	19.4	12.8	24.3	14.8
Spent compost (2 year old)	30	11.0	24.0	20.6	22	12.3	14.5	26	19.2	12.3	24.2	14.1
Coir pith + FYM (1:1; v/v) + culture of <i>A. faecalis</i>	30	13.2	24.0	23.3	20	12.8	13.9	27	20.1	13.2	24.2	15.3
Coir pith + FYM (1:1; v/v)	30	12.8	26.0	20.0	20	12.2	12.8	26	21.1	13.5	24.6	14.3
Coir pith + culture of <i>A. faecalis</i>	30	12.7	24.0	23.9	20	11.8	13.1	27	20.4	12.9	24.3	14.9
Coir pith	30	11.8	25.0	22.5	22	11.7	12.8	25	21.8	12.3	24.8	14.2
CD (0.05)	--	--	1.48	1.63		0.99	--	--	1.82	0.9	--	--

a – Time taken for first harvest; b – Average fruit body weight

2.2. Total indoor compost production using thermophilic fungi

The trial was assigned to five different centres i.e. Murthal, Ludhiana, Pune, Pantnagar and Solan. A new method of compost preparation inside the tunnel was developed at DMR, Solan, which do not cause any air pollution neither causes any noxious gas emission. The technology as such was put for multilocation trials alongwith traditional short method technology as check. Out of five centres Murthal centre could not do it as the cultures of thermophiles did not multiplied. In all the other four centres no increase in yield was recorded except at Solan centre where only a marginal increase in yield could be observed. Nevertheless, at all the centres the crop could be grown satisfactorily without emission of foul gases. Good yield were obtained at Pantnagar centre with a maximum yield of 19.69 kg /100 kg compost in traditional short method compost against a yield of 15.87 kg /100 kg compost. Also it was evident the quantity of compost produced was higher in total indoor composting technique. Overall average yield showed 11.3 kg /100 kg compost in indoor composting technology (Table 4.18).

Table 4.18 Yield of white button mushroom by total indoor composting technology

Treatment	Mushroom yield (kg/100kg compost) at different centres					
	Ludhiana	Murthal	Pantnagar	Pune	Solan	Average
Total Indoor composting using thermophile	8.78	--	15.87	11.77	8.82	11.3
Traditional short method compost	9.01	--	19.69	16.27	8.10	13.3
CD (0.05)	--		1.33	1.47	--	--

The time taken for first harvest and average fruit body weight was also recorded during the experiment. The minimum time taken for first harvest was 14 days in indoor compost at Solan centre. Also at Ludhiana centre the time taken for first harvest was lower in indoor compost but in all other centres the time taken was recorded to be higher in total indoor compost than check (Table 4.19). Average fruit body weight was also found to be lower in indoor compost than check except at Ludhiana centre where the average fruit body weight was at par in both the composts.

Table 4.19 Average fruit body weight (g) and time taken to first harvest

Treatment	Time taken for first harvest (days post casing) and fruit body wt (g)											
	Ludhiana		Murthal		Pantnagar		Pune		Solan		Average	
	a	b	a	b	a	b	a	b	a	b	a	b
Total Indoor composting using thermophile	21	11.3	--	--	32	13.77	47	14.41	14	--	28.5	13.2
Traditional short method compost	25	10.6	--	--	27	14.69	36	16.38	15	--	25.7	13.9
CD (0.05)	--	0.69	--	--	--	0.41	--	0.52	--	--	--	--

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

The analysis of the total indoor compost at different centres showed that all the parameters varied in a range like pH (7.5-7.8), nitrogen (1.9-2.47%) and moisture (67-71%) (Table 4.20). This analysis shows that the compost made by Indoor method of composting tend to have more moisture and nitrogen content. The pH remains in acceptable range. The low yields obtained in the experiment may be due to the higher moisture content in the compost.

Table 4. 20 Compost parameters in total indoor compost

Centres	pH	Nitrogen (%)	Moisture (%)	Colour
Ludhiana	7.5	2.47	67	Dark brown
Murthal	--	--	--	--
Pune	7.8	1.9	71	Light brown
Pantnagar	--	--	--	--
Solan	7.7	2.4	67	Light brown

Experiment No. 9 Standardization of cultivation technology of *Macrocybe giganteum*

The trial was assigned to seven different centres i.e. Udaipur, Murthal, Bhubaneshwar, Raipur, Pune, Samastipur, and Solan. The mushroom *Macrocybe giganteum* is a new entry in the list of cultivated mushroom portfolio of the country and resembles very much to button mushroom. This mushroom requires a higher temperature of 28-35°C. The cultivation trials of this mushroom could not be completed last year as the workshop and technical programme was finalized little late. The experiments are under progress at this time and results are awaited by the end of June 2012. The results of the experiment will be included in the next year's annual report.

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

Different Centres have reported the collection of 266 specimens of wild mushrooms during the year and about 50 collections have been deposited at the DMR Gene Bank, though most of these without adequate 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 cultures/dried specimens /spore prints submitted	Identification sheet/Photographs /Passport data supplied
ICAR RC for NEH, Barapani	7	0	0
ICAR RC for ER, Ranchi	10	0	10
PAU, Ludhiana	4	0	0
TNAU, Coimbatore	12	0	0
GBPUA&T, Pantnagar	13	0	0
MPUA&T, CoA Pune	65	7	0
NDUA&T, Faizabad	1	0	0
IGKV, Raipur	22	3?	0
MPUA&T, Udaipur	61	15	0
KAU, CoA, Vellayani	15	15	15?
CCSHAU, Hisar	1+?	0	0
OUA&T, Bhubaneswar	14	0	0
RAU, Samastipur, Pusa	16	0	0
CAU, CoH&F, Passighat	18	3	18?
YSPUH & F, Nauni, Solan (HP).	0	0	0
HAIC, Murthal (Haryana)	7	7	0

Udaipur Centre

Seven districts of Rajasthan namely Udaipur, Sriganganagar, Hanumangarh, Bikaner, Chittorgarh, Sirohi and Pratapgarh of Rajasthan inhabiting Variable Mushroom flora were surveyed for Collection, identification and conservation of wild edible mushrooms from local market in the month of July, August and Sept.2011. It was observed that Khumbi Mushroom (*Phellorinia inquinense*) synonym (*Phellorinia herculea*) was collected in tonnes and sold in the Market as fresh as well as in dried form at the rate of Rs 100-120/kg depending upon the quality of mushroom in Sriganganagar, Hanumangarh and Ratangarh (Fig 5.1).

A total of 6 forest forays were conducted in Sriganganagar, Hanumangarh, Bikaner, Sirohi, Chittorgarh, Pratapgarh and Udaipur districts of Rajasthan. The surveys were carried out during pre-monsoon, monsoon and post-monsoon season to collect the wild fleshy fungi occurring in different period and in different areas. Total

of 60 different samples of wild fleshy fungi were collected, cultured, preserved and identified. Some important genera are listed in table 5.2 and Fig.5.2.



Fig.5.1. *Phellorinia* –collection and sale in markets of Rajasthan

Fig.5.2 wild collection from Rajasthan

Table.5.2 Germplasm collected and submitted by Udaipur centre

	Mushroom specimen	Acc no.		Mushroom specimen	Acc no.
1	<i>Auricularia</i> sp	DMRO-431	8	unknown	DMRO-438
2	<i>Polyporus badius</i>	DMRO-432	9	unknown	DMRO-439
3	<i>Schizophyllum commune</i>	DMRO-433	10	<i>Hericium</i> sp	DMRO-440
4	unknown	DMRO-434	11	<i>Trametes gibbosa</i>	DMRO-441
5	<i>Ganoderma lucidum</i>	DMRO-435	12	<i>Polyporus</i>	DMRO-442
6	<i>Polyporus morri</i>	DMRO-436	13	<i>Pleurotus</i> sp	DMRP-263
7	<i>Lepista nuda</i>	DMRO-437	14	<i>Agaricus</i> sp	DMRA-127
			15	<i>Agaricus</i> sp	DMRA-128

Vellayani Centre

Specimens collected from Thiruvananthapuram, Alleppey, Kottayam, Kannur and Idukki were isolated and 20 cultures sent to DMR along with their photographs. Accession numbers have been obtained for 15 cultures (as per letter No F.DMR/ culture/2011-12 dated 30.12.2011.). Five cultures were damaged during transport. Details regarding date of collection, location, association with trees, temperature range, rainfall of areas from where the

specimens have been collected have been recorded. List of mushroom collected given in Table.5.3. Photos of mushroom collected are shown in Fig 5.3.

Table. 5.3 The mushrooms collected and sent to DMR culture bank

Sl No	Vellayani code	DMR Code	Sl No	Vellayani code	DMR Code
1	VLYN-11-1	DMRX-1248	9	VLYN-11-11	DMRX-1256
2	VLYN-11-3	DMRX-1249	10	VLYN-11-12	DMRX-1257
3	VLYN-11-4	DMRX-1250	11	VLYN-11-13	DMRX-1258
4	VLYN-11-5	DMRX-1251	12	VLYN-11-14	DMRX-1259
5	VLYN-11-6	DMRX-1252	13	VLYN-11-15	DMRX-1260
6	VLYN-11-7	DMRX-1253	14	VLYN-11-19	DMRX-1261
7	VLYN-11-8	DMRX-1254	15	VLYN-11-20	DMRX-1262
8	VLYN-11-9	DMRX-1255			

Barapani Centre

Seven specimens belonging to *Ramaria*, *Lactarius*, *Scleroderma*, *Boletus* genera and three unidentified mushrooms were collected. Being single specimens, it was not possible to send dried samples for identification. Market survey was done and *Ramaria* spp, *Gomphus* sp and *Clavariadelphus* were purchased and dried. Attempts to culture those mushrooms on PDA and MA failed due to contaminations. Dried and wet specimens are preserved. Assorted *Ramaria* sp locally called ‘Tit syier’ i.e. chicken mushroom and mixed wild mushrooms were found to be sold at Barabazar, Shillong, Meghalaya.



Fig.5.3. Wild collections from Vellayani, Kerala

Ludhiana Centre

In Punjab, survey of field area was conducted during the rainy season (July-August, 2011). Four mushrooms were collected namely, one agaricale mushroom, *Coprinus* sp., *Ganoderma* sp. and *Volvariella* sp. Agaricale mushroom and *Volvariella*, being edible, were further characterized. Agaricale mushroom was collected from the lignicolous habitat in Ludhiana. The mushroom was sweet giving typical mushroom smell. Pileus was white, globus, non sticky, non hygrophanous with scales, measuring 4-6 cm in diameter. Stipe was white centrally attached, round with bulbous base with no veil or volva, measuring 7-10cm in length. Gills were white and free. The spore print was brown in color. *Volvariella* was also collected from the lignicolous habitat in Ludhiana. The mushroom was bitter with a typical mushroom smell. Pileus was off-white, companulate, non sticky, non hygrophanous with scales, measuring 3-5 cm in diameter. Stipe was white centrally attached round with volva at the base, measuring 5-7cm in length. Gills were white and adnexed. The spore print was creamy white in color.

Bhubaneshwar Centre

Surveys were conducted at different locations of the state during kharif, 2011. Mushrooms have been collected and identified based on available information. Important genera were *Agaricus campestris*, *Boletus* sp., *Calocybe* sp., *Coprinus* spp., *Cantharellus* sp., *Ganoderma lucidum*, *Lycoperdon* spp., *Rassula* sp. and *Termitomyces* spp. Besides, 12 isolates of *Volvariella volvacea* collected from different agro-climatic zones of the state are maintained in the laboratory in pure culture. Molecular characterization of the isolates has been taken up for further studies.

Pantnagar Centre

A total of thirteen specimens were collected during monsoon season in Uttarakhand, The specimen included *Lentinus* spp., Polypore, *Fomes roseus*, *Ganoderma* sp, *Auricularia* sp, *Coriolus versicular* and *Lenzite* sp

Pasighat Centre

During the survey wild oyster mushrooms were collected during rainy season in jungle, deep forest and decayed wooden trees (Fig 5.4). A total 18 edible sp were collected (Table. 5.4). Only three sp CHF2012_9, 13 and 14 were able to grow on media. All the three accessions are submitted to DMR culture bank and passport data of all has been submitted.

Table.5.4. Mushroom sp collected from Arunachal forest

S.No	Species	Colour	Size	Spore print colour	Remarks
CHF2012_1	Jews ear	brown	3-3.5cm	white	fruit tree
CHF2012_2	Shiitake	Light yellow	2-2.5cm	Light yellow colour	„
CHF2012_3	Jews ear	Dark brown	1-2 cm	Light yellowish white	„
CHF2012_4	Jews ear	Light yellow	2-4 cm	white	„
CHF2012_5	Jews ear	Light yellow	4-5.5 cm	Light white	„
CHF2012_6	Oyster	Grey	4.5-5.5cm	white	„
CHF2012_7	Jews ear	Dark brown	3.3-4cm	White	„
CHF2012_8	Shiitake	Grey	1.5-2.5cm	Light yellow	„
CHF2012_9	Oyster	Grey	6-7.5cm	White	„
CHF2012_10	Oyster	Blackish grey	4-5cm	White	„
CHF2012_11	Milky mushroom	Black colour	5-5.5cm	White	„
CHF2012_12	Oyster	White	3-5cm	White	„
CHF2012_13	Shiitake	Light yellow	1.5-2.5cm	Light yellow	„
CHF2012_14	Oyster	Grey	2-2.2cm	White	„
CHF2012_15	Oyster	Creamy	3-3.5cm	White	„
CHF2012_16	Shiitake	Light grey	3-4.5cm	White	„
CHF2012_17	Jews ear	Light brown	3-4.5cm	White	„
CHF2012_18	Milky mushroom	Dark grey and white color	2.5-3cm	white	„

Pune Centre

Survey for collection of wild edible mushroom for exploring the possibilities of selection of promising strain if any from different forests of western Maharashtra (Sahayadri ranges) Vidharba and Konkan region of Maharashtra were undertaken during monsoon of year 2011-12 (Fig 5.5). The mycological characterization of



Fig.5.4. Wild mushroom collected from Arunachal Pradesh

collected samples was done as per the Proforma provided by DMR, Solan. On the basis of mycological characters the wild samples were identified up to generic level by using reference book and internet information on website www.mushroomexpert.com. During the survey work, in all sixty-five samples were collected. Out of sixty five collected specimens only forty two were identified up to generic level, from these sixteen viz. *Agaricus* sp., *Pleurotus* sp., *Tricholoma* sp., *Termitomyces* Sp., *Polyporus* Sp., *Boletus* Sp., *Clitocybe* sp. and *Tuber* sp were found to be edible one. The tissue isolation of the collected samples were done and in all 45 pure cultures of mushroom were successfully derived and maintained. A total of 13 samples were submitted to DMR, Solan, out of which only seven cultures could be revived. No passport data/ spore prints submitted.



Fig. 5.5 Wild collection from Pune centre

Pusa (Samastipur) Centre

The survey was conducted during the month of June 2011 to Oct. 2011 (rainy season) in Samastipur Vaishali, west Champaran, Darbhanga, Sitamarghi. A total of 16 germplasm were collected and identified. Attempts were made for culturing the germplasm on PDA/MEA medium. All germplasm were cultured except *Mycenia* spp and *Termitryces*. All materials were dried and preserved at centre. No culture/Passport data/spore prints submitted

Raipur Centre

Chhattishgarh is bestowed with Mushroom biodiversity and is treasure for variety improvement. Hence, extensive survey was done in various locations in rainy season to harvest the mushroom flora from nature. The observations were recorded spore print, wet and dry preservation was done. Pure culture and spawn were prepare some of the variety could run properly on substrate and some of them could not be cultured. *Calocybe* spp were collected from four locations viz., Krishak Nagar, Amlidih and Abhanpur and all were cultured. *Pleurotus* spp was harvested from Rajnandgaon and Pali sari forest. *Scleroderma* spp white and brown were collected from mahasamund and Tumgaon, *Ganoderma* spp, *Polyporus* spp and *Coprinus* spp were collected

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from Raipur, *Russula* and *Cantherellus* from Gariaband and ghatarani Katghora, *Termitomyces* spp and *Volvariella* spp from Raipur and *Amanita* from Pali forest. (Three cultures of *Calocybe indica* have been submitted to DMR culture bank. No Passport data/spore prints submitted).

Coimbatore Centre

About 14 mushroom flora belonging to the genus *Pleurotus*, *Calocybe*, *Ganoderma*, *Polyporus*, *Lycoperdon*, *Volvariella*, *Russula*, *Schizophyllum*, *Auricularia* were collected from various regions of Tamil Nadu. The specimens were pure cultured and maintained. (Neither culture nor passport data was deposited with the DMR culture bank).

Ranchi Centre

A total of eight mushroom specimens were collected during the year, which included *Scleroderma* sp., *Boletus* sp, *Termitomycetes* sp., *Geastrum saccatum*, *Rusulla* sp, *Ganoderma* sp., and *Termitomycetes* sp.

6. EXTENSION ATIVITIES

Udaipur Centre

a. Training

A total of 14 on campus trainings were organised during the year and a Total of 261 farmers attended the trainings on Button, Oyster and Milky mushroom cultivation technology (Fig.6.1 and 6.2). The details of trainings are given in Table.6.1. Besides, 7 off campus training programmes were also organised on oyster mushroom cultivation, which was attended by a total of 200 farmers (Table. 6.2). A total of 170 tribal women have also participated in the training programmes.



Fig.6.1 Training conducted at Udaipur Centre

Table.6.1 On Campus Training programmes held from April 2011 to March 2012

Date and duration	Topics	No. of Trainees	Native of Trainees
20-04-11 (3 days)	Oyster mushroom cultivation	5 Entrepreneurs	Udaipur
11-07-11 (3 days)	Oyster mushroom cultivation	4 Entrepreneurs	Tonk, Jaipur, Udaipur
10-08-11 (1 day)	Oyster, Button and Milky mushroom cultivation	30 Farmers	Udaipur
26-09-11 (3 days)	Oyster mushroom cultivation	3 Farmers	Udaipur and Chittorgarh
10-10-11 (1day)	Oyster mushroom cultivation	30 Farmers	Bharatpur
16-11-11 (1 day)	Oyster mushroom cultivation	40 Farmers	Barmer
16-11-11(1 day)	Oyster mushroom cultivation	19 Students	C.D.F.S.T.Udaipur
05-12-11	Oyster mushroom cultivation	3 Farmers	Udaipur
18-01-12	Oyster mushroom cultivation	20 Farmers	Nimuch (M.P.)
21-01-12	Oyster mushroom cultivation	30 Farmers	Nimuch (M.P.)
22-01-12	Oyster mushroom cultivation	20 Farmers	Rajsamand
02-02-12	Oyster, Button and Milky mushroom cultivation	17 Students	C.D.F.S.T. Udaipur
16-03-12	Oyster mushroom cultivation	24 Students	Jabalpur (M.P.)
11-04-12	Oyster mushroomcultivation	16 Student	Udaipur

Table 6.2 Off Campus Training programmes held from April 2011 to March 2012

Date and duration	Topics	No. of Trainees	Native of Trainees
01-02-2012 (1 days)	Oyster mushroom cultivation	40 Farmers	Village - Harmithiya and Thal (Sirohi)
03-02-2012(1 days)	Oyster mushroom cultivation	20 Farmers	Village – Tidi (Udaipur)
04-02-2012(1 days)	Oyster mushroom cultivation	20 Farmers	Village – Kharpina Udaipur
19-03-2012(1 days)	Oyster mushroom cultivation	20 Farmers	Village –Jhadol (Udaipur)
20-03-2012(1 days)	Oyster mushroom cultivation	40 Farmers	Village- Basol and Gudli, Rajsamand
21-03-2012(1 days)	Oyster mushroom cultivation	40 Farmers	Village - Salumber and Jhadol, Udaipur
23-03-2012(1 days)	Oyster mushroom cultivation	20 Farmers	Village- Sakroda, Udaipur

b. Mushroom Mela and Exhibition

- Badgaon KVK, Udaipur 31-01-2012 Farmers : 2000
- RCA, Campus Udaipur 28-02-2012 Farmers : 500

c. Development of Mushroom museum

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

d. Revenue Generation

- Supply of quality Mushroom Spawn- 530 Kg

Bhubaneswar Centre

a. Training and exhibition

During 2011-12, nine trainings on mushroom cultivation and processing with a total number of 219 trainees and six trainings on mushroom spawn production with a total number of 74 trainees were conducted at the centre. Off campus training programmes were attended at 20 locations involving 839 trainees on mushroom cultivation out of which 494 were ladies of different Self Help Groups (SHGs)(Fig 6.3 & 6.4). The centre participated in 2 krishi-exhibitions. Besides, 12 TV programmes were done during the period. The scientist also participated in farm-scientist interaction programmes (Table 6.3)



Fig.6.2 Training conducted for Tribal people at Udaipur

Table 6.3 Details of extension services extended by OUAT, Bhubaneswar Centre (2011-12)

Date	Venue	Particulars	No. of participants
A. Trainings			
25.4.11-29.4.11	OUAT	Mushroom cultivation and processing	9
20.5.11-29.5.11	OUAT	Spawn production	12
21.6.11-25.6.11	OUAT	Mushroom cultivation and processing	31
12.7.11-21.7.11	OUAT	Spawn production	5
8.8.11-12.8.11	OUAT	Mushroom cultivation and processing	33
25.8.11-29.8.11	OUAT	Mushroom cultivation and processing	30
15.9.11-24.9.11	OUAT	Spawn production	17
18.10.11-22.10.11	OUAT	Mushroom cultivation and processing	22
14.11.11-16.11.11	OUAT	Spawn production	24
21.11.11-25.11.11	OUAT	Mushroom cultivation and processing	24
14.12.11-23.12.11	OUAT	Spawn production	12
17.1.12-21.1.12	OUAT	Mushroom cultivation and processing	20
12.3.12-16.3.12	OUAT	Mushroom cultivation and processing	30
19.3.12-23.3.12	OUAT	Mushroom cultivation and processing	20
22.3.12-31.3.12	OUAT	Spawn production	4
B. Exhibitions			
24.8.11	College of Agril. OUAT	Large number of farmers visited the stall from all over the state	
9.2.12	Community centre, OUAT	Large number of farmers visited the stall from all over the state	

b. VIPs Visit to Mushroom Lab

20.6.11-22.6.11	Hon'ble Members of QRT from ICAR, New Delhi
20.7.11	Dean of Research, OUAT, Bhubaneswar
23.7.11	Dean of Research, OUAT, Bhubaneswar

30.8.11	Sj. Prafulla Samal, Hon'ble Minister, Department of Culture and Tourism, Govt. of Odisha
19.11.11-21.11.11	Dr. Manjit Singh, Director, Directorate of Mushroom Research, Solan
31.12.11	Dr. Dev Kumar, ADG(Education), ICAR, New Delhi
8.1.12	Dr. H. P. Singh, DDG (Hort.), ICAR, New Delhi
15.3.12	Director General, Bangladesh Council of Agricultural Research, Dhaka

c. Revenue Generation

A quantity of 2323 packets of spawn (200g each) of paddy straw and oyster mushroom were distributed to the farmers @ Rs.8.50/packet with a resource generation of Rs.19,745.50.

d. TV/Radio Talks delivered

16.5.11	Straw mushroom cultivation	DD-6, Bhubaneswar
16.5.11	Problems associated with summer straw mushroom cultivation	DD-6, Bhubaneswar
11.8.11	Problems associated with straw mushroom cultivation	ETV(Oriya), Hyderabad
13.8.11	Cultivation of milky mushroom	DD6, Bhubaneswar
26.8.11	Phone-in on cultivation of milky mushroom	DD6, Bhubaneswar
7.9.11	Improvement of bio-efficiency of straw mushroom	ETV(Oriya), Hyderabad
7.9.11	Use of good quality spawn in mushroom farming	ETV(Oriya), Hyderabad
7.9.11	Competitor moulds, diseases of mushroom and their management	ETV(Oriya), Hyderabad
18.11.11	Oyster mushroom cultivation-I	DD6, Bhubaneswar
26.11.11	Oyster mushroom cultivation-II	DD6, Bhubaneswar
9.12.11	Improving productivity of oyster mushroom	ETV(Oriya), Hyderabad
13.2.12	Value addition in mushroom	DD6, Bhubaneswar

e. Farmers' exposure visit

One thousand one hundred forty seven farmers, Government functionaries, Scientists, school and college students from all over the state and neighbouring states visited the centre during 2011-12.



Fig 6.3 Participation of OUAT in exhibition



Fig. 6.4. Cultivation of paddy straw mushroom under the tree in Orissa



Fig. 6.4. Mushroom training at OUAT centre

Pasighat Centre

a. Trainings and exhibitions

Four mushroom production and one spawn production training was conducted. Two training (23 and 28 February 2012) was conducted in CHF campus and 30 and 25 peoples attended the training programme, respectively (Fig. 6.5 and 6.6). Two mushroom training was conducted at village level (Mirku and Berung village) 52 and 51 people attended the training,



Fig.6.6 Spawn production training at Pasighat



Fig. 6.5 Training organized at Pasighat centre

respectively. One spawn production training was conducted for the grower and 13 farmers were benefited. One farmer Gekong Pertin started the spawn production unit at mebo village. Director and his team visited the CHF, Pasighat unit and delivered lecture to the students. Further they have also conducted advanced mushroom production technology to the farmers.

b. Visits, Field days, participation in Kisan mela and demonstration

- Active participation in Workshops, Kisan-mela and Demonstration etc.
- Mushroom production technology was exhibited during CAU AGRIFAIR 12th Jan 2012 and Northeast agri-fair 10-12 Feb 2012, Guwahati.
- Mushroom museum was developed with collection of 450 sp. wild and edible mushrooms of Arunachal Pradesh
- Visited the farm of a progressive farmer Mr Taimur Jamoh, Mrs Oti Sitang and Gekong Pertin production units.



Fig.6.7 Director, DMR Solan visiting Pasighat centre

c. Revenue Generation

- A total of 146 kg of quality mushroom spawn was supplied to growers during 2011-12.
- A total of 8 bottles of master spawn was supplied to the growers.

Pune Centre

a. Trainings and exhibitions

For general awareness generation and transfer the technology of mushroom cultivation, twelve training programmes were organized at the centre on first Saturday of every month. Total 108 trainees participated in these trainings (Fig. 6.9). A three days training programme on mushroom production technology was organised in collaboration with Zonal Project Directorate, Hyderabad and Director of Extension, MPKV, Rahuri for the Subject Matter Specialists (SMS) of different KVK's of Maharashtra state w.e.f. 06-08th February 2012. The centre has also participated in three state level exhibitions during the year.



Fig.6.8 Director, DMR Visiting the farm of Mr Taimur Jamoh and Gekong Pertin



Fig.6.9 Mushroom Cultivation Training cum Demonstration programme for programme rural women's of Narayangaon, Pune

Three mass demonstrations cum trainings were organized by this centre to popularize oyster mushroom among women's Self Help Group members and unemployed youths at Village - Narayangaon, Tal Junnar, Dist- Pune; Village - Lauki, Tal- Ambegaon, Dist- Pune and Village - Khed Shivapur, Tal- Bhor, Dist- Pune. The technology of mushroom cultivation was also transferred by sending pamphlets by post as well as by participating in exhibitions and attending farmer's rallies organized by different agencies at different places. The centre has also delivered 6 radio talks on mushrooms.

b. Revenue generated

Total receipts of **Rs. 1, 05,745** (Rs. One Lakh five thousand seven hundred forty five only) were generated during the year 2011-2012. The details are given in Table 6.4.

Table.6.4 Details of revenue generation by Pune centre

Sr. No	Particulars	Rate /Charges Rs.	Nos./Quantity	Amounts Rs.
1.	Oyster training (Trainees)	Rs.500/person	108	54,000.00
2.	Spawn sale	Rs.60/kg	597.5 kg	35,850.00
3.	Fresh button mushroom	Rs. 75/kg	106.800 kg	8,010.00
4.	Fresh oyster mushroom	Rs. 50/kg	4.700 kg	235.00
5.	Visitors	Rs. 05/ Student	1530	7,650.00
			Total	1,05,745.00

c. Academic activities

In addition to research activities as per mandate the staffs of mushroom project were also engaged in teaching activities. The Scientist of the Centre has also participated in undergraduate and postgraduate teaching programmes of the University. A total of four Masters research was guided at the centre as well as the scientists of the centre also acted as external and internal examiners for various agricultural colleges.

Ludhiana Centre

a. Trainings and exhibitions

A total five training programmes and eight lecture cum demonstration have been conducted at the centre. The training programmes were attended by a total of 141 farmers whereas in lecture cum demonstration programmes were attended by a large number of farmers (Fig. 6.11 & 6.12). The lecture cum demonstration programmes has awareness generation objectives. The List of training programmes and lecture cum demonstration programmes is given in Table 6.5.



Fig.6.10 Visits of Dr. Manjit Singh, Director, DMR, Solan to Aditya Mushroom, Dist. Sangli (M.S.)

Table.6.5. Training programmes and lecture cum demonstration programmes conducted at Ludhaina centre

Training Courses		
Date	Venue	Participants
18-20.05.11	Tropical mushroom training course, PAU, Ludhiana	21
12-16.09.11	Mushroom training course for rural farmers, PAU, Ludhiana.	55
29.02.12	Training for Field Assistants from Dept. of Agronomy, PAU, Ludhiana.	05
12.03.12	Mushroom training course for rural ladies at KVK, Samrala.	30
26.03.12	Training course for farmers from Distt. Amritsar at KVK, Amritsar	30
Lecture-cum-Demonstrations		
04.04.11	Lecture on mushroom technology for farmers of Kulu at Ludhiana	40
25.08.11	Lecture on mushroom production and processing to farmers of CoAE at Ludhiana	11
28.09.11	Showcasing mushroom technology at Agri technologies, CIPHET in PAU, Ludhiana	Many
07.10.11	Lecture on mushroom technology at Wheat Auditorium at PAU, Ludhiana	Many
17.11.11	Lecture on status and scope of mushroom production in India at PHPTC, PAU, Ludhiana.	20
21.12.11	Utilization of crop residues for mushroom production to farmers at KKG, PAU, Ludhiana	Many
02.02.12	Lecture cum demonstration on mushroom technology at Farmers Association Function at PAU, Ludhiana	Many
01.03.12	Demonstration to conduct visit of Chief Guest on mushroom cultivation at Convocation Function at PAU, Ludhiana	Many

b. Kisan melas/demonstration

- The centre organized a total of 13 kisan melas during the year.

08.09.11	Regional Kisan Mela at Ballawal
12.09.11	Regional Kisan Mela at Faridkot
15.09.11	Regional Kisan Mela at Bathinda
19.09.11	Regional Kisan Mela at Rauni

22-23.09.11	Kisan Mela at PAU, Ludhiana
27.09.11	Regional Kisan Mela at Gurdaspur
07.03.12	Regional Kisan Mela at KVK, Amritsar
12.03.12	Regional Kisan Mela at Ballowal
14.03.12	Regional Kisan Mela at Bathinda
15.03.12	Regional Kisan Mela at Rauni
21-22.03.12	Kisan Mela at PAU, Ludhiana
29.03.12	Regional Kisan Mela at Gurdaspur
27.03.12	Regional Kisan Mela at Faridkot

c. Visits

06.04.11	ADGC (Edu.) ICAR to MRC at PAU, Ludhiana
22.06.11	Director, DMR, Solan to assess AICRP experiments, PAU, Ludhiana
01.07.11	Field trials on milky mushroom at KVK, Bahawal
12.01.12	Director and Principal Scientist, DMR, Solan

d. TV/Radio Talks

12.04.11	Garam rutt dian khumban di kasht, DDK, Jalandhar
13.09.11	Khumban di kasht, DDK, Jalandhar
03.01.12	Punjab vich khumban di kasht, DDK, Jalandhar



Fig. 6.11 Hands on Training at Ludhiana Centre



Fig. 6.12 Exhibition in Kisan Mela at Ludhiana

e. Seminar/Workshop

01&02.08.11	XIII Workshop of All India Research Project on Mushrooms at DMR, Solan
08&09.12.11	Res. and Extn Specialists Workshop on vegetables, fruits and flower crops at PAU
19.09.11	Seminar on Accelerated Crp Improvement Program, PAU, Ludhiana
28.11.11 to 02.12.11	Workshop on small business planning and promotion at PAMETI, PAU, Ludhiana

f. Revenue generation

During the year 2011-12, 975kg mushroom spawn of *Agaricus bisporus*, *Calocybe indica*, *Pleurotus* spp. and *Volvariella volvacea* was supplied to the mushroom growers of Punjab.

Samastipur Centre

a. Training

- Awareness programme at Agapur Vaishali. 65 women and 82 farmers participated.
- Awareness programme on 15 April 2011 at Adapur village, Champaran. 103 farmers participated.
- One-day awareness programme in Gopalpur village on 18-07-11. 60 women farmer participated.
- One day on campus training cum awareness programme organized on 19-07-11. 28 women participated.
- One day training cum awareness programme organized 28-07-11. 14 women participated.
- Participated in Inter State Udyan Diwas organized in Bihar from 10-14 Aug 2011. Demonstration of mushroom production and mushroom recipes i.e. Mushroom soup, Mushroom pakora, Mushroom matar (pea) Sabji and Mushroom do pyaja. More than 3000 visitors tested these items.
- One day training cum awareness programme organized in Lahladpur (Saran) on July 21st 2011. 65 trainees including 32 women participated.
- One day training cum awareness programme organized in Bhikhampur (Siwan) on July 22th 2011. 53 trainees including 48 women participated.
- On Aug 28th 2011, A Kisan Gosti was organized in village Thahara of Samastipur district. 214 women from near by villages participated.
- 6 days off campus training programme on” mushroom production” was organized from Sept.4th - 9th 2011 in Shahid Khudiram Bose Central Jail Muzaffarpur. 31 under trails from Bihar, West Bengal, UP (India and Bangladesh) participated.
- 6 days off campus training programme on” Spawn production” was organized from Sept.4th - 9th 2011, in Shahid Khudiram Bose central Jail Muzaffarpur. 6 under trails from Bihar participated .
- On campus, 6 days training programme was organized on” mushroom production” was organized from Sept.12th to 17th 2011. 31 participants from different district of Bihar includes 26 under graduate Industrial Microbiology students (20 girl students).
- One day training cum awareness programme on button mushroom production in Agapur (Vaishali), Silout, Narouli and Phakuli (Muzaffarpur) was organized on Oct. 16th 2011.
- One day training cum awareness programme on button mushroom production in Sharepur (Muzaffarpur) was organized on Nov. 06th 2011.



Fig.6.13 Mushroom stall run by prisoners inaugurated at Central Jail at Muzaffarpur, Bihar



Fig.6.14 Training programme at Pusa Centre, Samastipur

- One day training cum awareness programme on mushroom production was organized in village Tilak Tajpur a nuxal prone area (Sitamarghi) 52 women from 10 self help groups and 15 farmers participated. Ten kg spawn along with kit was distributed.
- Six days training programme was organized from Nov. 8th to 13th 2011. 25 women from participated.
- One day training cum awareness programme was organized on Nov. 12th 2011. 35 Kisan Mitra from Bhagwnpur Block (Siwan district) participated.
- Six days training programme was organized from Nov. 14th to 19th 2011. 40 students from G.D. College, Begusarai (20) and R. B. College Dalsinghsarai, Samastipur (20) participated.
- Two days mushroom production training was organized on 21-22 Nov.2011 at KVK Sabour (BAU, Sabour) Bhagalpur. 31 trainees including 2 1women participated.
- One day training cum awareness programme was organized in Shaheed Jubba Shahini Central Jail Bhagalpur on Nov. 22nd 2011. A total 102 (under trails and convicted jailed) person participated.
- On campus one training cum awareness programme was organized on Nov. 24th 2011. A total of 40 “Krishak Salah Kar” participated in the programme.
- One day training cum awareness programme organized in Bhairganj (Nadda) village of West Champaran district. 40 women participated in the programme.
- Research Council (Rabi-2011) was attended on Dec. 8th to 9th 2011 in RAU. Technologies of mushroom production & consumption was demonstrated and served mushroom soup to 145 scientists and 198 other person including media person
- Two days Mushroom Production Training was conducted on 12th -13th , 2011 under NAIP. A total of 53 participants from Muzaffarpur, Sheohar West Champaran were attended.
- One day awareness camp on mushroom production was organized in GD College Begusarai on Dec. 14th 2011. Fifty students of industrial microbiology were actively participated and they have started oyster mushroom production with 55 bags.
- One day awareness programme organized in MUBBI village of Rosra in Samastipur district on Dec. 15th 2011 under NAIP project. A total of 48 women participated.
- Awareness camp organized on Dec. 18th 2011 at Sahid Khudiram Bose Central Jail Muzaffarpur. A sale counter for fresh mushroom and spawn inaugurated by Jail SP Muzaffarpur (Fig 7.13).
- One day awareness cum training programme organized in the premises of Red Cross Society, Muzaffarpur on Dec 25th 2011. A total of 37 HIV⁺ participated.
- On campus one-day awareness cum training programme organized on Dec 27th 2011. A total of 19 trainees from “Dayanand Saraswati self help group” (Village-Ghasaut, Block-Meenapur) from Muzaffarpur district and 32 trainees from” Samjik shodh avam Vikash Kendra **Mehasi**“ East Champaran district participated.
- One day awareness camp on mushroom production was organized on Jan 22nd 2012 in Sherpur village of Muzaffarpur district. A total of 72 interested people participated.
- Participated in 26th Jan celebration with mushroom Jhanki.
- On campus one training cum awareness programme on mushroom production on Jan 31st 2011.
- On campus one day training cum awareness programme on mushroom production was organized on Feb 2nd 2012. A total of 35 Kisan Salahkar from Nawada district participated (Fig 7.14).
- Participated in” Mushroom production and processing” training programme as resource person organized by KVK Sabour, BAU Bhagalpur on Feb. 4th & 5th ,2012

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- One day on” campus training cum awareness programme” on mushroom production was organized on Feb 07th 2012. A total of 40 Kisan Salahkar from Vaishali district of Bihar participated.
- Six days mushroom production training was organized from Feb. 6th -11th, 2012. A total of 40 UG students from RAU, Pusa Samastipur (2), LS College, Muzaffarpur (20), GD College, Begusarai (16) and 2 women from Vaishali and Chhapra district participated. Out of 40 trainees, 30 girls/women participants actively involved in the programme.
- Participated in Kisan Mela organized by RAU from Feb 17th to 19th 2012 and display mushroom stall as a MUSHROOM HUB. Farmers from all over Bihar participated. Dr. Mangla Rai Ex DG ICAR and Sri Narendra Singh Hon’ble Agriculture minister Bihar visited MUSHROOM HUB and awarded 1st prize awarded by Hon’ble Agriculture minister.
- On campus one day training cum awareness programme on mushroom production was organized on Feb. 23rd 2012. A total of 80 SMS participated in the programme.
- On campus two days training programme on mushroom production was organized on March 14-15th 2012. A total of 24 scientists from KVKs of RAU participated.
- Fifty nine farmers from Darbhanga, Madhubani they were exposed to production, protection management, harvesting and consumption of button mushroom on March 15th 2012
- Participated in Kisan Mela organised by IARI Regional station Pusa Bihar Mushroom stall was placed by RAU and farmers adapted by RAU. More than 2000 farmers including Hon’le Minister Animal Husbandry visited the activity related to mushrooms.
- On campus one day training cum awareness programme organised on March 16th 2012. A total 43 of kisan salahkar from Vaishali district of Bihar participated.
- One mushroom spawn production and training centre was established by Madhu Patel (trained from DMR Solan) in Nalanda district with the financial assistance by NHM and ATMA.
- Financial assistance of Rs. 15 lacs with 90% subsidy has been sanctioned to Smt. Aanita kumari of Chandi, Madhopur of Nalanda district of Bihar for mushroom spawn and training centre.
- One mushroom spawn lab with training centre has been established in Jamui district with financial assistance of Rs. 9.5 lakhs (with 100% subsidy) by NABARD .
- Twelve mushroom production/ integrated unit/spawn production projects (20lakhs/50lakhs/15 lakhs) with 90 % subsidy has been sanctioned by the Govt. of Bihar

b. Visitors

- 2380 Primary level to Matric class students under Chief Minister Educational Tour from all district of Bihar.
- A total of **20,560** farmers visited from Bihar, Jharkhand and Eastern UP.
- QRT members of DMR, Solan including Dr. AK Bakshi, Chairman (VC, SBP KVV Meerut, UP), Dr. RN Verma, Ex-Director DMR Solan, Dr AK Patra Ex-Prof. OUA&T Bhuvaneshwar, Dr. R. P. Singh Ex-Prof & Director Advanced Centre of studies GBP UA&T, Uttarakhand and Dr. B. Vijay, Principal Scientist and Secretary QRT visited the centre on Sept. 18- 19, 2011.
- Hon’ble Minister Animal Husbandry department Gov. of Bihar Sri Giriraj Singh visited Mushroom centre and interacted to the farmers on 21st Jan 2012.

- Hon'ble her excellence wife of Governor, Bihar along with her team visited mushroom unit on Jan 27th 2012 (Fig 6.15). Women mushroom growers from Samastipur, Vaishali and Darbhanga interacted her.
- Hon'ble Advisor (Agriculture), Govt. of Bihar Dr. Mangla Rai visited Mushroom centre and interacted to the farmers on 17th Feb. 2012.
- Hon'ble Minister Agriculture Govt. of Bihar Sri Narendra Singh visited Mushroom centre and interacted to the farmers on 19th Feb. 2012.
- National Monitoring team of weed control visited mushroom production centre and AICRP on mushroom programme in near villages. Suggested for processing and value added products during interaction on March 14th 2012.
- Member of National monitoring team of NHM New Delhi visited mushroom programme in Nalanda on March 15th 2012 and mushroom spawn production activity in Rau and adopted villages in Samastipur district on March 16th 2012. He appreciated the efforts made by women.



Fig.6.15. Her Excellency Wife of Governor of Bihar visiting Pusa Centre

c. Mushroom Diwas/Mela

- Mushroom stall was placed in State level **Kisan Mela** organised by RAU from 17th to 19th Feb. 2012. A large number of farmers from Bihar, Jharkhand and Eastern UP visited Mushroom Hub. Growers from all over Bihar placed Mushroom Stall.
- Mushroom stall was placed in Samastipur “**Jila Foundation Diwas**” organized from Nov. 14th to 15th 2011. A large number of visitors exposed mushroom production and consumption technology. Five women groups trained from RAU were also placed the mushroom stalls. They were honoured by District administration with a cash prize of Rs. 500=00 (Rs. five hundred only) each and a certificate.
- Participated in **Bihar Shatabdi Diwas** celebration in Samastipur district from March 22nd to 24th 2012. More than 2000 farmers including officers, etc visited mushroom stall. A mushroom recipes counter was opened. Recipes includes Mushroom pakura, Kheer, Mushroom chilli, mushroom peda, mushroom Do pyaja, mushroom karry, mushroom pickles, mushroom muttar (peas) and mushroom sabbji were the focus of the attraction (Fig 6.16).



Fig.6.16 AICRP centre Pusa participating in a Kisan Mela

d. TV TALK

- Bihar me mushroom ki vyavsayeek kheti : TV Centre Patna.

e. Recognition

- Mushroom Hub bagged first prize in State Level Kisan Mela Organized in RAU, Pusa Feb. 17-19, 2012.
- Book on Mushroom production Released by Hon'ble Minister of Agric. Bihar.
- Project financed by Govt. of Bihar. Twenty farmers sanctioned 15 Laks (each) for spawn lab establishment, 20 lakhs each to 29 farmers for compost production and 50 Lakhs to 10 farmers for integrated mushroom unit establishment at 90 % subsidy.

e. Revenue generation

Spawn sold	:	2177 kg
Fresh Mushroom sold	:	556 kg
Spawn sale	:	Rs. 152390.00
Mushroom sale	:	Rs. 38920.00
Training	:	Rs. 10447.00
Total Revenue generated	:	Rs. 295780.00

Ranchi Centre

a. Training

- Fourteen one days training programmes were conducted on oyster mushroom cultivation at the station under different training programmes during the year under report in which a total of 300 farmers were trained in 13 on campus trainings and one off campus training on mushroom production the details are shown in Table 6.6.

Table 6.6 Mushroom Training conducted at ICAR RCER, RC Ranchi during 2011-12

Sponsored by	Subject	Training Dates	Period	No of trainees
ATMA West Singh bhoom	Mushroom cultivation	01 to 5 Mar.11	One day	25
NAIP,Dumka	Mushroom cultivation	10 to 11 Mar.11	One day	25
NAIP,Jamtara	Mushroom cultivation	14 to 15 Mar.11	One day	22
Mobile Agriculture School Service, Ranchi	Mushroom cultivation	20 to 24 July 11	One day	25
ATMA Jamtarda	Mushroom cultivation	July 2011	One day	40
NAIP,Buxure	Mushroom cultivation	20 to 22 Oct.11	One day	26
ATMA Bokaro	Mushroom cultivation	15 to 19 Nov.11	One day	25
ATMA Bokaro	Mushroom cultivation	22 to 26 Nov.11	One day	25
Diara Vikash Pariyogna ,Patna	Mushroom cultivation	24 to 28 Nov.11	One day	21
ATMA Deoghar	Mushroom cultivation	01 to 05 Mar.12	One day	25
ATMA West singhbhoom	Mushroom cultivation	13 to 17 Mar.12	One day	18
ATMA Pakur	Mushroom cultivation	19 to 23 Mar.12	One day	25
ATMA Pakur	Mushroom cultivation	24 to 28Mar.12	One day	24
NAIP,Dumka	Mushroom cultivation	29- to 31 Mar.12	One day	19

b. Revenue Generation

- A total of 5718Kg spawn was made and 5043.6 kg Mushroom spawn was sold to farmers and 674.4 kg spawn was used for experimentation. Hence total of 674.4kg spawn were used during in a year from April 2011to March 2012.During experimentation of 355.3 kg oyster mushroom & milky mushroom, 39 kg button mushroom, 0.8kg paddy straw and 12 bags of oyster mushroom were sold.

c. Visits

- During 15-17th September 2011, Honorable chairman and members of QRT, DMR, Solan has visited this centre (Fig 6.17). The have visited different farmers mushroom farm at SRI Bariatu, Ram Krishna Mission, Morabadi, BIT, Booty more, and Edelhatu on 15-16th Sept,2011.



Fig.6.17 QRT Team of DMR Visiting Farmers field in Ranchi



Fig.6.18. Newspaper clipping on extension activities of AICRP centre. Ranchi

d. Talk in Doordarshan and All India Radio

- Dr J.P.Sharma delivered a talk on *Aaj Ki Bat Subjio ko Rogo Se Bachaye* on 29.11.2011
- Dr J.P.Sharma delivered a talk on *Mushroom Utpadan Dvara Labh Awaim Garma Sabji me Rog Prabandhan* on 20.04.2011

d. Newspaper items

- The Paper clipping about mushroom extention in different districts of Jharkhand by the farmers as well as Centre have been is shown in Fig.6.18 & 6.19.



Fig.6.19. Jharkhand state govt is also giving due care to mushroom industry

Barapani Centre

a. Training

- On and off campus trainings on oyster mushroom cultivation were conducted for tribal people (Table 6.7). Total number of participants trained was 45 that included 20males and 25 females. One student from Doon (PG) college of Agriculture Science and Technology, Camp Road, Selakui, Dehradun-248 007, India was given 8 days training in mushroom cultivation.

Table 6.7 Details of mushroom trainings conducted during 2011-12 at Umiam Centre

Period	Male	Female	Total
14/2/11	8	2	10
21/4/11	2	-	2
04/6/11	1	-	1
24/10/11 to 25/10/11	3	8	11
27/1/12	5	15	20
12/3/12 to 19/3/12	1	-	1
Total	20	25	45

b. Resource generation

Spawn sale

Oyster mushroom spawn	235.2 kg
Culture tubes	6 nos
Fresh mushroom	9.4kg

Revenue (Rs.)

Spawn @ Rs. 50/- per kg	11,760
Culture tubes @ Rs. 50/tube	300
Mushroom @ Rs. 50/- per kg	4670
Training fee	1000
Total	Rs.17, 730

c. Participation in Exhibition/Mela

- A programme was organized at Nongpoh on 26 March 2012 under Tribal sub Plan by the Institute for distribution of seeds to tribal people, wherein spawn was displayed for distribution and booking/sale. Many farmers showed interests and some collected spawn also.
- Trainings, participation in Fare and timely spawn supply have resulted in increased (63%) demands of spawn compared to previous year 2010-11

Faizabad Centre

a. Training, demonstrations and Kisan mela

- In order to promote mushroom cultivation in eastern Uttar Pradesh concerted efforts were made through trainings, demonstrations, advisory services, participation in Kisan Mela and by supplying ready to grow for cultivation of various mushrooms in different seasons (Fig 6.20).
- Number of growers trained 85
- Number of trainings organized 02
- Gosthies organized/participated 04
- Demonstration in Kisan Mela 02
- Demonstrations (Fig 7.21) 03
- Number of visitors 550



Fig.6.20. Training program at Faizabad Centre

b. Revenue generation

- Sold produce of experiments : 185.00 kg
- Spawn sale : 312.00 kg

c. Projects sanctioned

- Integrated Management Of Plaster Moulds In Milky Mushroom from Rashtriya Krishi Vikas Yojna (RKVY) for Rs 18.650 Lakh.
- Production And Supply Of Spawn To The Farmers Rashtriya Krishi Vikas Yojna (RKVY) for Rs 30.00 Lakh.

d. Visitors

5.4.211 Dr.Manjit singh, Director DMR, Solan

28.1.12 Mr.J.R.Sharma, Rtd. Dy. Director, HPTC, Solan



Fig.6.21 Farmers field trial at Faizabad

Hisar Centre**a. Training and lectures**

Table. 6.8 Trainings conducted at Hisar Centre

Training	Venue	Date	Duration (Days)	No. of participants
Oyster mushroom cultivation	MTL	4.10.11	1	70
Mushroom cultivation	Vill. Sulakhani	9.12.11	1	50 (SC/ST)
Mushroom cultivation	Hansi	11.12.11	1	50 (SC/ST)
Mushroom processing	CFST	9.3.11	1	24
Mushroom production technology	MTL	Feb. 6-24, 2012	19	21
Mushroom production technology	-do-	Feb. 9-24, 2012	16	15 (SC/ST)
Mushroom cultivation	MTL	Sept. 12-14, 2011	3	50
Mushroom as a health food and oyster mushroom cultivation	FTC PNB, Sachakhera (Jind)	Sept.5,2011	1	100 school teachers (female)
Mushroom cultivation	MTL	20.1.12	1	25 (J&K)
Mushroom cultivation	-do-	20.3.12	1	30 (SC/ST)
Mushroom cultivation	-do-	18.11.11	1	19
Mushroom cultivation	-do-	4.10.11	1	18

b. Demonstrations and Kisan mela

- Mushroom stall during Kisan Mela at CCS HAU, Hisar on March, 14-15, 2012.
- Mushroom stall during Kisan Mela at Village Kilo (Rohtak) on March 17, 2012.
- Lectures and demonstration on button, oyster and milky mushroom cultivation at HAIC, Murthal (Sonapat).
- Lecture on mushroom cultivation at KVK, Rohtak.
- Farm Advisory service both at the campus as well as mushroom growers farm.
- Extension literature on mushroom cultivation was provided to the farmers.
- Duty at ATIC (free help line of the university)
- Radio talk on mushroom cultivation.
- TV talk on button mushroom cultivation.

c. Other activities

- Invited lecture and discussion on Mushroom Production: present status, future scope, strategies, gaps and recommendations in Haryana in “Stake- holder Workshop on Horticulture Development” organized by Haryana Kisan Ayog. Dec. 16-17, 2011
- Motivated for the construction of pasteurization tunnels by two mushroom growers namely Mr. Satbir, Vill. Shishwala and Mrs.Asha Rani, Vill. Matarsham.
- Quarantine inspection of mushroom farm facilities at mushroom farm of Mrs. Rajbala Chaudhary, Vill. Akbarpur- Barota; for the import of button mushroom planting material.
- ZAREAC meetings at KVK, Rohtak.
- 3rd Global Conference-Plant Pathology, January 10-13, 2012. MP Univ. Agric.& Tech. Udaipur (Raj.)

d. Revenue generation

- Commercial spawn supplied 661 kg

Raipur Centre

a. Training

- A total of 44 training programs were conducted during the year, which was attended by a total of 1733 farmers (Fig 6.22). The details of the trainings are given in Table 6.9 & 6.10.

Table 6.9 Farmers training Organized on various aspects of mushroom

Activities	Duration (days)	No. of Training	Participation
Mushroom Cultivation & Processing Technology	05 days	09	346
Spawn Production Technology.	05 days	04	147
Mushroom cultivation, Processing and spawn production Technology	05 days	31	1240
Total			1733

b. Mushroom Days, Kisan melas, Exhibitions, etc.

Table 6.10 Farmers training through, mushroom day; Exhibitions; farmer and students group visits.

Activity	No.	Duration (Days)	Participation
Mushroom day	05	01	1474
Kisan Mela on silver jubilee of IGKV & Golden Jubilee of CoA, Raipur	01	03	2000
University Kisan mela	01	02	1500
Rajyotsav Exhibition	01	05	3000
Food Tech Exhibition cum seminar	01	02	1500
Students visit: Schools of Dantewada tribal district, Schools of Bijapur tribal District, Higher Sec. School Jadutola Rajnandgaon	03	01	178
Farmers group visit	04	01	131
Total Participants			9783

b. Visitors

- Mushroom stall was visited by Hon’ble Governor Shri Shekhar Datt, Hon’ble Chief Minister CG Dr. Raman Singh, Hon’ble Agriculture Minister state Shri Chandrashekhar Sahu, Hon’ble Central Minister Agriculture for State Hon’ble Charandas Mahant. Hon’ble Vice Chancellor IGKV Raipur Dr. S. K.

Patil and Hon'ble Vice Chancellor Sherekasmir Agril. Uni. Jammu Dr. Anwar Alam and thousands of farmers during during different occasions (Fig. 7.23).

- Miss Omega Toppo, Additional Commissioner, Raipur during December 2011 and obtained the information's regarding mushroom cultivation, processing and marketing.
- Hon'ble Vice Chancellor Dr. S.K. Patil, IGKV, Raipur visited mushroom research lab on November 2011 and obtained the information's regarding mushroom cultivation, processing and marketing activities.
- DRS Dr. V.S. Thrimurty, IGKV, Raipur visited mushroom research lab on time to time and obtained the information's regarding mushroom cultivation, processing and marketing activities.
- Dean Dr. O.P. Kashyap, CoA, Raipur visited mushroom research lab on time to time and obtained the information's regarding mushroom cultivation, processing and marketing activities.
- Agriculture Secretary, Central Govt. of India visited mushroom research lab on January 2012 and obtained the information's regarding mushroom cultivation, processing and marketing.



Fig.6.22. Spawn production training at Raipur centre

e. TV / Radio Talks

- Awadhiya G.K (2011). Mushroom beej (spawn) Utpadan kaise kare. Bhueian ke goth. Doordarshan, Raipur 24 Oct.2011.
- Awadhiya G.K (2011). Mushroom Utpadan ek Rojgarmulak Upai 12 Dec.2011 Krishi darshan Doordarshan Raipur
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Fig.6.23 Dignitaries visiting mushroom stall at Raipur

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Pantnagar Centre

a. Training

- In all thirteen training programmes were organized by the centre during the year (Fig 6.24).
- A total of 346 farmers were trained and number of women participation was observed (Table. 6.11).

Table. 6.11 Details of mushroom training held at Pantnagar Centre

Date of training	No. of farmers	Place	Date of training	No. of farmers	Place
11.07.2011	15	MRTC, Pantnagar	Dec. 09, 2011	27	Bagga Farm, Khatima
July 25-29, 2011	21	MRTC, Pantnagar	Dec. 27, 2011	30	Partappur, Khatima
Sept. 14, 2011	28	Simla Pistaure, U.S. Nagar	Mar. 06, 2012	33	HALDWANI, Nainital
Sept. 22, 2011	29	Pakki khamria, U.S. Nagar	Mar. 12, 2012	20	LALKUAN, Nainital
Sept 26-30, 2011	32	MRTC, Pantnagar	Mar. 29, 2012	29	Shantipuri U.S. Nagar
Oct. 19, 2011	28	Chandipur, U.S. Nagar	Mar. 30, 2012	28	Bindukhatta, Nainital
Oct. 20, 2011	26	Motahardu, Nainital			

b. Demosntrations

Table 6.12. Details of onfarms demonstration by Pantnagar centre

Name	Place	Spawning date	Casing date	Yield (kg/Qtl.)
Chitrangan	Simla Pistaure	10.01.12	23.01.12	18.65
Ved Prakash	Simla Pistaure	10.01.12	23.01.12	19.66
Nakul	Simla Pistaure	10.01.12	23.01.12	14.56
Viful	Simla Pistaure	10.01.12	23.01.12	23.20
Ram Dulare	Simla Pistaure	10.01.12	23.01.12	17.85
Ramaji	Simla Pistaure	10.01.12	23.01.12	16.80
Thaneshwar Prasad	Sehjani	10.01.12	23.01.12	19.58
Ved Prakash	Sehjani	10.01.12	23.01.12	15.35
Kamleshwar Prasad	Sehjani	10.01.12	23.01.12	19.26
Naresh	Sehjani	10.01.12	23.01.12	21.02
Brajesh Kumar	Sehjani	10.01.12	23.01.12	15.50
Mukesh Kumar	Sehjani	10.01.12	23.01.12	16.35

b. Revenue generation

- Spawn Supply: Mushroom spawn (1396 Kg.), master spawn (91 bottles) and culture tubes (37 Nos.) of different species/ strains supplied to the growers and spawn producers during the year 2011-12.
- Compost supply : The centre has supplied 149 Qtl. of compost to farmers during the year 2011-12.



Fig.6.24 Training programs conducted at Pantnagar centre

Vellyani Centre

a. Activities

- A total of 9 trainings were conducted during the year under report (Fig 7.25). The details of the training are given in the table. 6.13.
- Participated in the Haritholsavam during September 18th -24th 2011 and arranged a mushroom stall where spawn, mushroom beds, cutlets, wine etc were sold out and an amount of Rs 14600/- credited to NARP.
- A book entitled “Koonukaludae lokam” authored by Dr. Lulu Das released by NABARD CGM and received by the Honourable Vice Chancellor of KAU on September 22nd 2011.
- The PI Dr. Lulu Das attended 7th International Conference on Mushroom Biology and Mushroom products held at Arcachon, France from October 4th to 7th 2011 and presented a paper “ Cooking Gods Own food in Gods own country the easy way”.

Table. 6.13 Trainings organized at Vellayani centre

Category	Date	No of days	Participation
Educated unemployed youth	26 th and 27 th August 2011	2	24
Educated unemployed	15 th -16 th November 2011	2	16
Educated unemployed youth and women	20 th -21 st December 2011	2	20
VHSE students	5 th ,6 th &7 th December 2011	3	21
Educated unemployed youth	24 th - 25 th February 2012	2	22
Training on spawn production (Military officer)	29 th February	1	1
Women sponsored by District Cooperative Bank	16 th March 2012	1	200
Awareness programme for women on mushroom cultivation	11 th April 2012	1	30
Educated unemployed youth	17 th and 18 th April 2012	2	13

- The PI attended the International Training on “ Participatory approaches to Integrated Crop Management of Horticultural crops” held at Hotel Samudra , Kovalam from October 24th to November 4th 2011. She also took a class for the delegates on “ Prospects of Mushroom cultivation in Kerala”.
- A group of 30 farmers from Solan visited the Department on 1ST February 2012. Two mushroom growers of the state were felicitated and trophy given to Mr. Ajay and Mrs. Prasanna. The function was presided by the Dean, College of Agriculture, Vellayani.
- Bulletin on mushroom cultivation authored by Dr Lulu Das was released by Honourable Ministry of Agriculture at Mascot Hotel, Thiruvananthapuram on 14th February 2012.
- As part of the rehabilitation programme for prisoners of Central Prison, Poojappura,



Fig. 6.25 Mushroom Training at Vellayani Centre



Fig.6.26. Mushroom Wine: A product from Vellayani

- Thiruvananthapuram mushroom cultivation was initiated on 23rd February 2012.
- Value added product “Mushroom wine “ standardized at AICRP centre was released by Honourable Vice Chancellor of KAU on 24 th March 2012 (Fig 7.26).
- Guiding MSc (Ag) student on “ Standardisatiion of techniques for the cultivation of Tricholoma giganteum in Kerala.
- Guiding one MPhill and one MSc Biotechnology student on mushroom projects.
- Supplied mother spawn to Swadishta mushroom, Surya Agrotech, Santhigiri Ashram, RARS, Kayamkulam, KVK Panniyur, Koonpura etc
- Sold 120 kg of spawn, 20 bottles of mushroom wine, 9 kg mushroom and 30 bottles of mother spawn from the AICRP centre.

Coimbatore Centre

a. Training

- During the year 2011-2012, twelve “One day training programmes” on mushroom cultivation



Fig.6.27 Training to self help groups at Coimbatore centre

were continued as usual on 5th of every month (Table 6.14).

- During the period, twelve one day trainings were conducted to 835 people and five numbers of five day-training programmes were organized on advanced mushroom cultivation techniques and about 26 people were benefited (Fig 6.27).
- 37 numbers short trainings and demonstrations were organized to 3791 school children (Fig 7.28).
- 14 numbers of short trainings and demonstrations were organized to 452 college students.
- About 1046 numbers of farmers from Kerala, Tamil Nadu, Andhra Pradesh, Bhuvaneshwar, Solan visited the Mushroom Laboratory of TNAU and the near by mushroom farms (Table.7.14).
- Open and Distance Learning Certificate course on Mushroom Cultivation were also offered to 11 participants.

Table. 6.14 Training program conducted at Coimbatore centre during 2011-12

Training no/Date	Men participated	Women participated	Total Participant	Total amount
One day Training programmes				
335/5.4.2011	32	14	46	6900
336/5.5.2011	73	12	85	12750
337/6.6.2011	29	13	42	6300
338/5.7.2011	51	22	73	18250
339/5.8.2011	99	53	152	15750
340/5.9.2011	48	13	61	15250
341/7.10.2011	29	9	38	9500
342/8.11.2011	64	14	78	19500
343/5.4.2011	64	10	74	18500
344/5.1.2012	64	17	81	20250
345/6.2.2012	35	16	51	12750
346/5.3.2012	32	12	44	11000
Total	620	205	825	
Five days training programmes				
19.9.11 to 23.9.11	5	3	8	
19 to 23.12.11	7	2	9	
27.2.12 to 2.3.12	6	3	9	

Table.6.15 Special training classes to Self Help Groups /Farmer groups

Date	Name of the visitors	Staff	Farmer	Total
9.6.11	Tribal Farmers from , WWF South workers Ghats officer, Idukki, Kerala	3	15	18
30.6.11	Muthoot Mihila Mithra Members, Muthoot Fin Corp Ltd , Coimbatore	1	9	10
13.7.11	Farmers trainees of District watershed Development Agency, Namaakal.	2	35	37
15.7.11	Farmer Trainees of District watershed Development Agency, Namaakal.	2	48	50
18.7.11	Self Help Group members of Rasipuram taluk, Namakkal	1	57	58
21.7.11	Tribal Promoters, WWF India, SWGL Office, Idukki, Kerala State	1	5	6
23.7.11	Farmer trainees of KVK, Madur, Karaikal	3	32	34
23.7.11	Farmer trainees of KVK, Nagapattinam Dt	1	56	57
23.7.11	Farmer trainees of KVK, Ilayangudi, Sivagangai Dt	2	22	24
23.7.11	Farmer trainees of KVK, Thiruvanamalai Dt	5	20	25
23.7.11	Farmer trainees of KVK, Pechiparai, Kanyakumari Dt	-	50	50
23.7.11	Farmer trainees of KVK, Pudukottai Dt	1	13	14
23.7.11	Farmer trainees of KVK, Kurinchipadi, Panruti, Cuddalore Dt	1	49	50
23.7.11	Farmer trainees of KVK, Pudukottai Dt	2	22	24
23.7.11	Farmer trainees of KVK, S.S. kulam Annur , Coimbatore Dt.	1	30	31
10.8.11	Krishi Bhavan Farmers , Palakadu, Kerala State	1	19	20

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23.9.11	Farmer trainees of ADA, Cheyyar, Thiruvannamali Dt.	1	50	51
4.11.11	ATMA farmers of Vellore, Thiruvannamali Dt	-	50	50
28.11.11	Farmers from Odissa , Odissa State	1	20	21
30.11.11	Members of FOAP-Aroor taluk, Kerala State	37	-	37
16.12.11	Trainees of High Value Agricultural Development agency, Andaman & Nicobar, port Blair	5	16	21
29.12.12	Farmer trainees of KVK, Pechiparai, Kanyakumari.	-	12	12
9.1.12	Farmer trainees of ADA-Bhavani, Coimbatore Dt	1	202	203
28.1.12	Members of Mushroom Growers Association of Solan, Himachal Pradesh	2	30	32
24.2.12	CAFTA Trainees,Dept. of Agronomy, TNAU, Coimbatore	20	-	20
13.3.12	Members of Public library Farmers club, Kerala	46	-	46
29.3.12	Farmer trainees of KVK, Theni	2	13	15



Fig.6.28 Training to school students at Coimbatore



Fig.6.29 Trainees from Afganistan at Coimbatore centre

b. Visitors

- Dr. Manjit Singh, Director of Mushroom Research, Solan,
- Dr. J.R. Sharma, Deputy Director (Retd.), Solan
- Five Plant Protection trainees from Afganistan (Fig 6.29)

b. Revenue generation

- During the report period, about 8525 numbers spawn bags ie., 2557.5 kgs were supplied to the growers of Tamil Nadu.

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- Awadhiya G.K., S.S. Chandravanshi (2011). tissue culture se sikha beej banana. *New Dunia* 30.Nov.2011
- Awadhiya G.K., S.S. Chandravanshi (2011). IGAU conduct three days training on mushroom production technology. *Hitwad*.
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- Awadhiya G.K., Anurag, S.S. Chandravanshi (2011). Mushroom Utpadan evam pransakaran prashikshan 20Aug.2011 *Haribhoomi*
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Thesis guided: 02

Project evaluation and comments for approval: 01

Samastipur Centre

Research Paper

- Rani, M., Dayaram, Patel, Y., and V.K. Singh (2011). *Calocybe indica* can also be grown in north India on wheat straw. Paper presented in National Conference on “Frontiers i Biological Sciences” held on Dec.4-5, 2011 at VBS Purvanchal University Jaunpur – 2220 01 UP. India

Book/Popular Articles/Builetin

- Mushroom Utpadan 2nd edition.
- Dayaram (2012) Mushroom ki saghan kheti. ATMA Sandesh. Published by Bihar Sarkar.
- Dayaram (2012) Mushroom Ki byavsayic kheti. Adhunik Kisan Jan. & Feb. 2012 (Mela viseshank).
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- Dayaram (2012) Mushroom utpadan : Safalta ki Kahi, RAU Publication.

Newspaper Clipping

- “Central jail me mushroom ka utpadan hoga” Dainik Jagarn. April 11th 2011.
- “Kheti bari karege Kaidi” Prabhat Khabar, April 11th 2011
- “Taki riha hokar phir nahi thame pistol”, Hindustan April 11th 2011.
- “Prisoners get a taste of mushroom farming” The telegraph April 16th2011.
- “Ab har mausam me mushroom: Dayaram” Dainik Jagarn. April 18th 2011.
- “Kheti bina khet ke, labh jaibe bhar ke” Dainik Jagarn. May 11th 2011.
- “Bajaronmukhi taknik ka vikash jarury” Hindustan, June 14th 2011.
- “Soon mushroom to flavour to midday meals” Hindustan times June 29th 2011.
- “Mahilaye mushroom ko byavsayik rupe me apnaye” Hindustan, July 19th 2011.
- “Panch sthano se ho rahi hai mushroom beej ki apoorti” Prabhat Khabar Aug. 27th 2011
- ”Marketing byavstha par mahilaoan ne uthaye saval” Prabhat Khabar Aug. 29th2011.
- Mushroom utpadan par karyashala ka ayojan” Hindustan, Aug. 29th 2011.
- “Kaidi khilayege testi mushroom” Dainic Jagran Sept 1st 2011.
- “ Krishi ke kshetra me mahilao ka dabdaba” Dainic Jagran Sept 4th 2011.
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- “Central Kara banega Mushroom beej ka utpadan Kendra” Prabhat Khabar Sept 5th 2011.
- “Prisoner’s training for livelihood” The telegraph Sept 5th 2011.
- “Mushroom utpadan se sudharega Kaidio ka Jeevan stari” Hindustan Sept.11th 2011,”
- Kaidio ko Kheti ke liye di jayegi madad. Prabhat Khabar Sept. 11th .201. “Rang layee kaidio ki mehanat” Dainik Jagran, Sept. 11th 2011,
- “ Mushroom per 6 diwaseey prashikshan shuru” Hindustan Sept.13th , 2011,”
- “Chatraye seekh rahi hai Beej utpadan” Prabhat Khabar Sept. 15th 2011
- “Aj se bikega Mushroom beej” Prabhat Khabar Sept. 15th 2011
- “Mushroom utpadan ke liye de sahyog” Hindustan Sept19th 2011
- “Very good : Ap ki mehnat ko Salam” Danik Jagran Sept 19th 2011.
- “Mushroom ki kheti dekhane pahuchi krishi bagyaniko ki teem” Danik Jagran Sept 19th 2011.
- “Bihar me mushroom ki kheti ko badhawa dene ki pahal” ”Hindustan Sept. 19th 2011
- “Vikash ke kayee prastav parit: Kulpati(VC)”. Prabhat Khabar Sept. 20th 2011

- “Very good : Ap ki mehnat ko Salam” Danik Jagran Sept 20th 2011.
- “QRT teem ne liya jayja” Prabhat Khabar Sept. 22nd, 2011
- “Mushroom ki kheti se savar rahi hai Kismat” Hindustan Sept 29th 2011.
- “Do dini mushroom prashikshan suru” Prabhat Khabar Oct.15, 2011.
- “Garibi unmulan va kuposan dur karne me mushroom sahayak” Hindustan Oct.16, 2011.
- “Jail me mushroom outlet” Danik Jagran Oct.,18, 2011.
- “Thara me Compost Nirman ki Ekai Khuli” Rastriya Sahara Oct. 23rd 2011.
- “Samuh banakar kare mushroom utpadan” Hindustan Nov.9th, 2011 (page 7)
- “Mushroom gamin uvao ka apna rojgar” Hindustan, Nov. 9th 2011 (Nayee Dishaye Page 4).
- “Samooch Banakar Kare Mushroom Utpadan” Hindustan Nov.13th, 2011 page 4.
- “Mushroom Utpadan me Mahir Hogi Kshatraye” Prabhat Khabar Nov.18th 2011.
- “Brand ambasder ke roop me kshatra kare kam” Hindustan Nov.20th, 2011.
- “Darbhanga ki Puspa ko Roll model ki upadhi” Prabhat Khabar Nov.20th 2011
- “Mushroom utpadan ka Kraiz badha” Danik Jagran Nov. 20th 2011.
- “Mushroom ki kheti se arthik unnat sambhav” Dainik Jagran Nov.22nd 2011-11-23.
- “Mushroom ki kheti se Kamyabi ka Pracham” Dainik Jagran Nov.22nd 2011-11-23.
- “Dodivasiya prashikshan shuroo” Prabhat Khabar Nov. 22th 2011.
- “Seekhe mushroom utpadan ke gur” Hindustan Nov. 22th 2011.
- “Kaidio ko mushroom uttpadan ka prashikshan” Hindustan Nov. 24th 2011
- “Champaran Me Mushroom utpadan shuru” Hindustan Nov. 28th 2011.
- “Karza me suroo ki mushroom ki kheti” Danik jagran 12th 2011
- “Do diwasiya mushroom utpadan camp suroo” Hindustan Dec. 13th 2011
- “Bihar mushroom utpadan me agrani: Shahi” Danik jagran Dec. 13th 2011
- “Kshatro ne shikhe mushroom utpadan ke gur” Hindustan Dec. 13th 2011
- “Jail me kaidi upja rahe hai mushroom, sahar bashi bhi le sake ge swad” Hindustan Dec. 19th 2011
- “Leejiye hajir hai jail me taiyar mushroom” Danik jagran Dec. 19th 2011
- “Jail gate par kharidiye mushroom va lahati” Prabhat Khabar Dec 19th 2011
- “AIDS peedit de ge swavlumban ka sandesh” Danik jagran Dec. 26th 2011
- “Mushroom se sakar huye sapane” Prabhat Khabar. Dec.26th 2011.
- “Sikhaaye gaye mushroom utpadan ke gur” Hindustan Dec. 29th 2011
- “Vajyanik ne kiya Mushroom utpdan ekai ka nirikshan” Sahara Jan 6th 2011
- “Mushroom hope for HIV Patients” The Telegraph 09th Jan., 2012.
- “Kisan ki bhumika me dikhe mantra” Hindustan Jan 22nd 2012
- “Kisan va shraddhalu ki bhumika me dikhi Rajyapal ki patni” Hindustan Jan 29th 2012.
- “Mushroom man aj logo ko sikhayege utpadan ke gur: Hindustan Feb 4th 2012.
- “Ab yuvaon ko lubhane laga mushroom utpadan” Hindustan Feb 9th 2012.
- “Brand ambasdar ke roop me karya kare kshatra” Hindustan Feb 12th 2012
- “Behtar aay ke liye labhkari hai mushroom ki kheti” Prabhat Khabar Feb 12th 2012
- “Beej ke mamale me atmm nirbhar honge sabhi gaov” Hindustan Feb 18th 2012
- “Teen din tak kisano se pata raha Visva Vidyalay prisar- In sttalo ko mila purskar” Dainik Jagran Feb 20th 2012.
- “Taknik biksit kare Vagyanik- Puraskri huye Vagyanik va kisan” Prabhat Khabar Feb.20th 2012.

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- “Kisano ke vikash ko Rajya Srkar krit sankalp” Hindustan Feb. 20th 2012
- “Mushroom utpadan ke liye hausale me koyee kami nahi” Hindustan Feb.26th2012 .
- “Krishi Vaigyaniko ne liya Mushroom utpadan ka Jayja” Dainik Jagran Feb.26th2012.
- “Poora desh khayega Bihari Mushroom” Prabhat Khabar Feb.28th2012 .
- “Mushroom Scheme making Muzaffarpur Jail bird’s”Hindustan Times March, 13th 2012
- “Nodal agencies ke roop me karya kare KVK , Mar.15th., 2012.

Symposia attended

- National Symposia on “Frontiers i Biological sciences” held on Dec.4-5, 2011 at VBS Purvanchal University Jaunpur – 2220 01 UP. India was attended and chair a session as REPORTIER and presented a research paper.

Pantnagar Centre

- Kushwaha, K.P.S and Mishra K.K. (2011). व्यावहारिक मशरूम उत्पादन ATIC, GBPUA&T, Pantnagar. pp111.
- Mishra, K.K. and Kushwaha, K.P.S. (2011). Evaluation of locally available agro-wastes for cultivation of medicinal mushroom *Lentinula edodes*. *J. Mycol. Pl. Pathol.* 41(1): 129-131.
- Neelam and Kushwaha, K.P.S. (2011). Effect of supplementation of Heterotrophic *Alcaligenes faecalis* to casing soil on yield stimulation of button mushroom 44th An. Convention of ISAC & National Symp. held at GBPUA&T, Pantnagar w.e.f. Nov. 25-26, 2011.
- Kushwaha, KPS, Singh PK, Mishra, KK and Bhardwaj, S.B. 2011. Cultural and morphological studies of *Hypsizygus ulmarius*, blue oyster mushroom. *Pantnagar Journal of Research*. 9(2):202-205.

Vellyani Centre

Research Papers

- Lulu Das (2011). Cooking God's own food in God's own country - the easy way. 7th International conference on Mushroom biology and Mushroom products (held at Arcachon France from Oct 4TH -7TH ABSTRACTS. pp133-134

Books

- “Koonukaludae Lokam” authored by Dr Lulu Das sponsored by NABARD.
- “Manam Mayakkum koon vibhavangal” authored by Dr. Lulu Das and Dr. K. Prathapan sponsored by State Horticultural Mission ready for publication (in press).

Bulletin

- “Koonukaludae lokam” authored by Dr Lulu Das.

Pune Centre

Name of the Scientist	Radio talks	Publications		
		Research	Technical	Extension
Dr. D. B. Shinde	1	2	4	1
Dr. A. M. Tirmali	2	5	5	1
Mr. V. K. Bhalerao	1	2	5	1
Total	4	12	14	3

- Bhalerao, V. K., A. M. Tirmali, T. K. Narute, and R.T.Sapkal.2011. Role of heterotrophic bacterium *Alcaligenes faecalis* and conditioning after casing pasteurization in button mushroom yield stimulation.

Paper presented in IPS (west zone) Symposium, “Recent Trends in Disease Management of Horticulture Crops” organized at Dr. B.S.K.K.V., Dapoli. on 19th and 20th Oct. 2011.

- Tirmali, A. M., V. K. Bhalerao, T. K. Narute, and R.T.Sapkal. 2011. Yield performance of different Strains of Oyster Mushroom (*P. sajor caju*). Paper presented in IPS (west zone) Symposium, “Recent Trends in Disease Management of Horticulture Crops” organized at Dr. B.S.K.K.V., Dapoli. on 19th and 20 th Oct. 2011.
- Tirmali, A. M., V. K. Bhalerao, T. K. Narute, and R.T.Sapkal. 2011. Yield performance of different strains of button mushroom (*Agaricus bisporus*). Paper presented in IPS (west zone) Symposium, “Recent Trends in Disease Management of Horticulture Crops” organized at Dr. B.S.K.K.V., Dapoli. on 19th and 20 th Oct. 2011.
- Tirmali, A. M., V. K. Bhalerao, T. K. Narute, and R.T.Sapkal. 2011. Cultivation of shiitake mushroom (*L. edodes*). Paper presented in IPS (west zone) Symposium, “Recent Trends in Disease Management of Horticulture Crops” organized at Dr. B.S.K.K.V., Dapoli. on 19th and 20 th Oct. 2011.

Pasighat Centre

- Bulletin 1 (Oyster mushroom cultivation, P.Raja, 2011)
- Manual 1 (Spawn production technology.P.Raja,2012)

Ludhiana Centre

- Anna Goyal, S Dhanda, S Kapoor and HS Sodhi 2011. Nutrition of wood ear mushroom. *Indian J Ecol.* **38**: 266-269
- Raj Saini, PK Khanna and S Kapoor 2011. *In vitro* degradation of wheat and paddy straw substrates by thermophilic fungi isolated from *Agaricus bisporus* compost. *Mush Res.* **20**: 33-36
- RK Jaswal, HS Sodhi, S Kapoor and J Kaur 2011. Enhancement of utilization of paddy straw for the cultivation of *Pleurotus* – An ecofriendly approach. *Agril Sci Digest – A Res J* **31**: 217-219
- J Kaur, HS Sodhi, S Kapoor, PK Khanna and RK Jaswal 2011. Strain improvement of speciality mushroom, *Calocybe indica*, through mutagenesis. *Applied Biology Res* **13**: 62-69

8. PERSONNELIA

Staff position at various AICMIP Centres during 2008-09

Sl.No	AICRP Centre	Name of staff	Designation
A. ICAR Institute based Centre			
1.	ICAR Research Complex for NEH Region, Umiam 793 103, Meghalaya	Dr Satish Chandra	Principal Scientist, Plant Pathology
2.	ICAR Research Complex for Eastern Region, Research Centre, Plandu, Ranchi 834010 (Jharkhand)	Dr. J.P. Sharma	Principal Scientist, Plant Pathology
B. SAU based Centre			
1	Dept. of Plant Pathology, Centre for Plant Protection studies, Tamil Nadu Agricultural University, Coimbatore - 641 003	Dr.V.Prakasam Dr. G.Thiribhuvanamala Th.P.Arumugam Th.P.Karuppusamy Th.C, Sundararajan Th.Venkatesan Th. P.Selvaraj	Mycologist Assistant 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.	Department of Plant Pathology N. D. University of Agriculture & Technology, Kumarganj, Faizabad – 224 229 (U.P.) India	Dr. Pradeep Kumar Sri Vijay Kant Sri G.P. Gautam Sri Brij Bhushan Sri Lalta Prasad	Mycologist Field Man Technician L.D.C./Typist Beldar
4.	Dept. of Plant Patholgy, College of Agriculture, CCS Haryana Agricultural Univ., Hisar - 124 005	Dr. Surjit Singh	Professor
5.	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. (Technician) Fieldman Typist-cum-Clerk Beldar
6.	Mushroom Research and Training Centre, G.B. Pant University of Agri. & Tech., Pantnagar – 263 145 (Uttarakhand)	Dr. KPS Kushwaha Mr. Himanshu Joshi Sh. Ramakant Singh Shri Santosh Kumar Sh. Deo Kumar	Mycologist Technical Assist. Jr. Assist./Fieldman Typist/clerk Beldar

7.	Dept of Plant Pathology, Collage of Horticulture and Forestry, Central Agricultural University, Pasighat – 791 102 (Arunachal Pradesh)	Dr. P. Raja	Assistant Professor
8.	Plant Pathology Section, College of Agriculture, Mahatma Phule Krishi Vidyapeeth, Pune-411 005	Dr. D.B.Shinde Dr. A. M. Tirmali 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
9.	Mushroom Research Laboratory, Dept. of Plant Pathology, Indira Gandhi Krishi Vishwavidyalya, Raipur – 492 006 (Chhattisgarh)	Dr. G. K. Awadhiya Dr. S.S. Chandravanshi Shri B. L. Sinha Shri R. K. Pandey Shri A. R. Sahu	Mycologist Assistant Mycologist Field Assistant LDC Peon (Beldar)
10.	Department of Microbiology, Faculty of Basic Sciences and Humanities, Rajendra Agricultural University, Pusa (Samastipur) - 848 125 (Bihar)	Dr. Dayaram	Associate Professor
11.	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
12.	Department of Plant Pathology College of Agriculture Vellayani – 695 522 Thiruvananthapuram, (Kerala)	Dr. D Geetha Ms. Deepa Rani	Mycologist Technical Assistant
C. Cooperating Centre			
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	Jr. Mycologist
2.	Haryana Agro Industrial Corporation R & D Centre, Opp. DCR University, G.T. Road, Murthal, Sonapat (Haryana)	Dr. Ajay Yadav	Scientist

9. BUDGET / RELEASED 2010-11

Centre	Recurring Contingency (Rs. Lakh)						Non-Recurring Contingency (Rs. Lakh)						Total (Rs. Lakh)	
	Estt. Charges		T.A.		Contingency including FLD		Equipments		Vehicle		Works			
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
ICAR RC NER, Barapani	-	-	-	-	0.64	0.64	-	-	-	-	60.10	60.10	60.74	60.74
ICAR RC ER, Ranchi	-	-	0.50	0.50	1.05	1.05	-	-	-	-	-	-	1.55	1.55
OUAT, Bhubaneswar	3.50	3.50	0.30	0.30	0.65	0.65	1.00	1.00	-	-	3.15	3.15	8.60	8.60
TNAU, Coimbatore	18.30	18.30	0.35	0.35	0.80	0.80	1.00	1.00	-	-	-	-	20.45	20.45
NDUA&T, Faizabad	15.30	15.30	0.41	0.41	0.50	0.50	1.50	1.50	-	-	-	-	17.71	17.71
CCSHAU, Hisar	3.50	3.50	0.10	0.10	0.65	0.65	1.00	1.00	-	-	3.10	3.10	8.35	8.35
PAU, Ludhiana	46.43	46.43	-0.18	-0.18	1.68	1.68	1.50	1.50	-	-	-5.0	-5.0	44.43	44.43
GBPUA&T, Pantnagar	14.35	14.35	0.60	0.60	1.20	1.20	2.00	2.00	-	-	3.15	3.15	21.30	21.30
CAU, Pasighat	4.50	4.50	0.35	0.35	0.60	0.60	2.00	2.00	-	-	6.45	6.45	13.90	13.90
MPKV, Pune	26.73	26.73	0.37	0.37	1.00	1.00	2.00	2.00	-	-	4.50	4.50	34.60	34.60
IGKV, Raipur	24.20	24.20	0.60	0.60	1.00	1.00	2.00	2.00	-	-	2.25	2.25	30.05	30.05
RAU, Samastipur	2.50	2.50	0.30	0.30	0.65	0.65	1.00	1.00	-	-	-2.5	-2.5	1.95	1.95
MPUA&T, Udaipur	12.25	12.25	0.30	0.30	1.00	1.00	1.50	1.50			3.20	3.20	18.25	18.25
KAU, Vellayani	12.45	12.45	0.60	0.60	1.30	1.30	1.00	1.00	-	-	3.10	3.10	18.45	18.45
UHF Nauni	-	-	0.05	0.05	1.07	1.07	-	-	-	-	-	-	1.12	1.12
HAIC Murthal	-	-	0.35	0.35	1.20	1.20	-	-	-	-	-	-	1.55	1.55

a- sanctioned amount

b- actual release