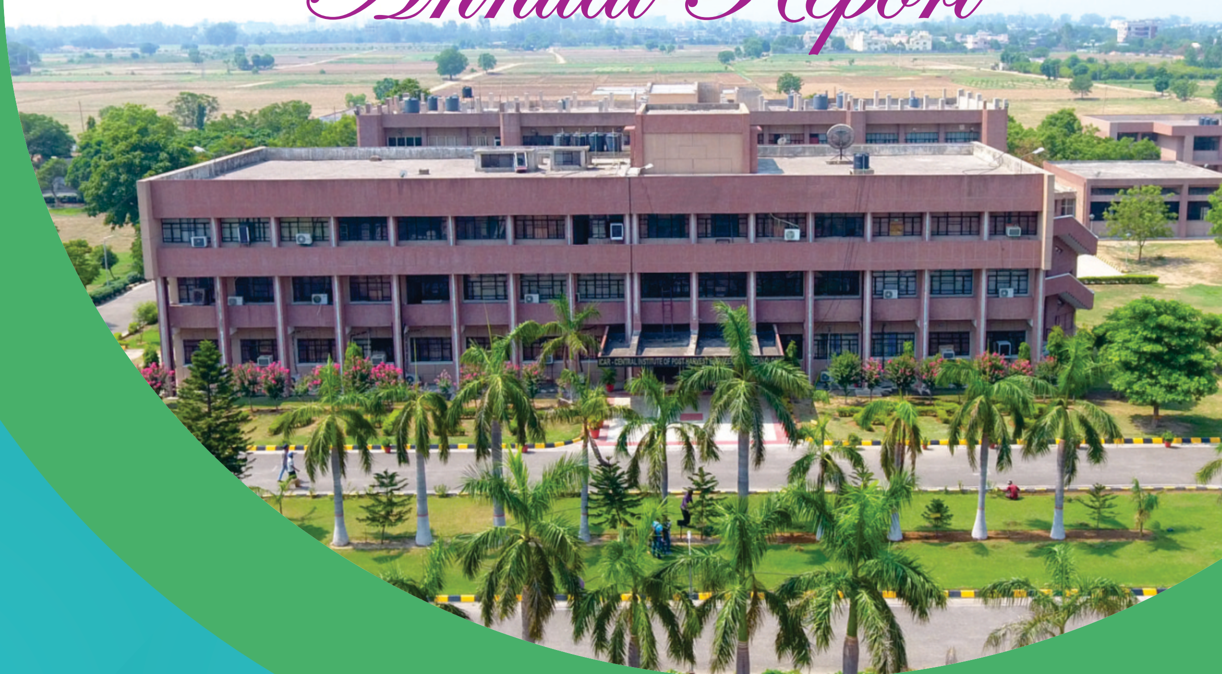
2022

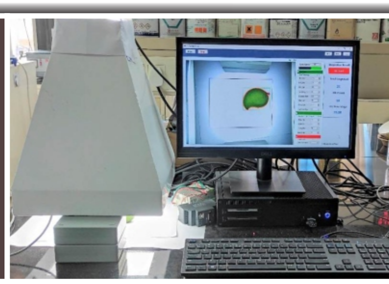
भाकृअनुप ICAR

भाकृअनुप–सीफेट ICAR-CIPHET

वार्षिक प्रतिवेदन

Annual Report





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INTERNATIONAL YEAR OF MILLETS 2023

Azadi Ka Amrit Mahotsav

भा.कृ.अनु.प.–केन्द्रीय कटाई–उपरान्त अभियांत्रिकी एवं प्रौद्योगिकी संस्थान
लुधियाना–141004 (पंजाब), भारत

ICAR-Central Institute of Post-Harvest Engineering and Technology
Ludhiana-141004 (Punjab), India
(An ISO 9001:2015 Certified Institution)
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ANNUAL REPORT
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Contents

भाकृअनुप
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ICAR-CIPHET

Preface

Post-harvest management, including the processing of agricultural products, is crucial for addressing concerns of food security and agricultural value chains. It reduces losses and spoilage while increasing the value of a variety of commodities. A significant paradigm change is visible in post-harvest interventions with renewed emphasis on improving process effectiveness, nutritional security, and food safety. ICAR-CIPHET has been providing necessary impetus for this change.

It is an honour for me to share with you the institute's Annual Report for 2022, which provides details on our outreach initiatives, R&D initiatives, and noteworthy accomplishments during the previous year. The institute is offering its services to the nation to raise farmers' income, create jobs through entrepreneurship, value addition, develop post-harvest technologies, process protocols, innovative machines, and utilise agro by-products. The institute is making a substantial contribution to several national programmes through two All India Coordinated Research Projects (AICRPs) and one Consortium Research Platform (CRP).

ICAR-CIPHET, during this year, has been able to develop a variety of machineries, agricultural structures, process protocols, and value-added products and contributed to the nation's sustainable development goals. A few of the developments that were completed during the period under review include a sensor-based system for tracking and tracing of banana during transportation, IoT-based real-time monitoring system for cold storage, photoreactor for ethylene degradation, mechanized system for making *Hawaijar*, buckwheat dehuller, popped makhana grading machine, table-top vacuum frying system and handheld NIR instrument. Further, protocol and models for machine vision camera-based grading of mango and AI based apple detection and localization models for robotic harvester have been developed. Processes are optimised for solid state fermentation for laccase enzyme production using one-factor-at-a-time (OFAT) approach, near infrared spectroscopy-based calibration model for detection of the adulterant metanil yellow, vinegar production using syrup waste generated during osmotic dehydration of mango, cryogenic grinding process for ashwagandha roots as well as for safed musli roots. Biochemical characterization of collagen hydrolysate (CH), black soybean varieties, microencapsulation of pigeon pea husk phenolic compounds using spray drying have also been achieved. The institute's activities were accomplished using institutional funds as well as financial, material, and intellectual assistance from various governmental agencies, corporate bodies, and stakeholders.

In 2022, 107 post-harvest technologies, equipment, process protocols, and products were developed with the help of 31 cooperating centres under the AICRP on PHET, 14 cooperating centres of AICRP on PEASEM and 5 of CRP on SA. A total of 46 technologies were given to the stakeholders, and 32 additional agro-processing centres were established.

ICAR-CIPHET promoted its brand by organizing the Industrial Interface Fair on Agro processing - 2022 (CIPHET-IIFA 2022), where institution's innovations were presented and demonstrated to various stakeholders. The institute has organized stakeholders meet, farmer scientist interface meets and also formed Farmer Interset Group to promote processing at farm level. In addition, a variety of human resource development initiatives, including farmer training programmes, winter school, EDP's, SCSP training, student trainings, etc., were arranged under various schemes for capacity building. Through entrepreneurial development programmes (EDP), farmer trainings, sensitization programmes, and special training programmes under SCSP, a total of 554 participants have been trained for post-harvest management of agricultural and animal production. Also, online programmes were offered to 1200 aspiring entrepreneurs from various locations as well as 150 students. ICAR-CIPHET has organised several programmes, webinars, webinar series, orientation programmes, EDPs, etc. under the banner of *Azaadi Ka Amrut Mahotsav*.

The progress accomplished in technology transfer, patent grants, research publications, and revenue generation, among other areas, is evidence of the institute's efforts. Seven technologies have been licenced by ICAR-CIPHET and five patents have been awarded. A total of 45 research publications from institute scientists were published in peer-reviewed journals on a national and international level. Net revenue for ICAR-CIPHET for the year was Rs. 61.12 lakh. A total of 79 machines from various regions of the country were assessed at our Post-Harvest Machinery and Equipment Testing Center (PHMETC).

Many efforts have been made to improve the usage of Hindi in day-to-day government operations and the implementation of major initiatives such as *Mera Gaon Mera Gaurav* and the *Swachh Bharat Mission*. The institution staff maintained a positive attitude and very efficiently used alternative channels for contactless meetings and information distribution. I have faith that our team will continue to work tirelessly to demonstrate its superiority in post-harvest research and development. This ICAR-CIPHET Annual Report 2022 is something I am proud to offer to the readers.

(Nachiket Kotwaliwale)
Director

कार्यकारी सारांश

भा.कृ.अनु.प.–सीफेट फसल कटाई–उपरान्त अभियांत्रिकी एवं प्रौद्योगिकी के क्षेत्र में देश का एक प्रमुख अनुसंधान संस्थान है। वर्ष 2022 में, संस्थान ने कटाई उपरांत नवीन तकनीकों एवं गुणवत्ता प्रबंधन से संबंधित कार्यप्रणालियों को विकसित किया है। प्रौद्योगिकी लाइसैंसिंग एवं प्रशिक्षण के माध्यम से इन प्रौद्योगिकियों को संबंधित हितधारकों जैसे किसानों एवं उद्यमी को स्थानांतरित करने में महत्वपूर्ण भूमिका निभायी है। संस्थान ने अपने विभिन्न बहु–विषयक और बाह्य वित्तपोषित अनुसंधान परियोजनाओं के माध्यम से अनुसंधान कार्यों में विशेष प्रसंस्करण संबंधित योगदान दिया। विभिन्न हितधारकों द्वारा प्रस्तुत समस्याओं के लिए प्रौद्योगिकी विकास द्वारा समाधान उपलब्ध कराया है। वर्ष 2022 के दौरान भा.कृ.अनु.प.–सीफेट की प्रमुख उपलब्धियों का सारांश निम्नानुसार हैः

विकसित मशीनें/उपकरण

एथिलीन क्षरण/नम्नीकरण के लिए फोटोरिएक्टर

आपूर्ति श्रृंखला में एथिलीन प्रबंधन की चुनौती को पूरा करने के लिए एथिलीन निम्नीकरण (घटाने) हेतु एक फोटोरिएक्टर का विकास किया गया है। जल्दी खराब होने वाले ताजे उत्पादों के एथिलीन प्रबंधन के लिए विकसित फोटोरिएक्टर डिजाइन में TiO_2 कोटिंग, फोटोकैटलिटिक और फोटोकेमिकल ऑक्सीकरण तकनीक के अनुप्रयोग कर एक नवीन उपकरण बनाया है। भंडारण सुविधा में फोटोरिएक्टर को उपयोग करके केले की जीवनावधि को 1.5–2 गुना तक बढ़ाया जा सकता है।

शीतभण्डारण के लिए IoT–आधारित रीयल–टाइम अनुवीक्षण प्रणाली

शीत संग्रहागार/शीतभण्डारण कक्ष के अंदर सूक्ष्म जलवायु मापदंडों जैसे तापमान, सापेक्षिक आर्द्रता, आदि के निरंतर अनुवीक्षण हेतु, IoT– आधारित मॉड्यूलर प्रणाली का निर्माण किया गया है। इस विकसित प्रणाली को प्याज के शीत संग्रहागार/शीतभण्डारण कक्ष में कार्यान्वयित किया गया है। मापदंडों में रीयल–टाइम मान, IoT प्लेटफॉर्म के वेब नियंत्रण–पट्ट में प्रदर्शित होते हैं। यह प्रणाली शीत संग्रहागार/शीतभण्डारण कक्ष के अंदर के मापदंडों की पूर्ण निगरानी करने में सक्षम है।

कुट्टू के छिलके निकालने वाली मशीन

कुट्टू अनाज से छिलका निकालने के लिए 1.25 kWh की बिजली की खपत के साथ 40 किग्रा/घंटा की क्षमता वाले एक मशीन का विकास किया गया है। छिलके वाले और छिलके रहित अनाज को अलग–अलग चैनलों में एकत्र किए जाता है। मशीन की छिलके निकालने की दक्षता 67% है। मशीन की अनुमानित लागत 40 हजार रुपये है।

पॉप्ड मखाना ग्रेडिंग मशीन

पॉप्ड मखाना के विभिन्न आकारों के आधार पर (12–15 मिमी, 15–19 मिमी और >19 मिमी व्यास) ग्रेडिंग के लिए एक सरल और सुगठित ग्रेडिंग मशीन विकसित की गई है, जिसकी क्षमता 200 किलोग्राम पॉप्ड मखाना प्रति घंटा है। ग्रेडर की सहायता से चपटा और अनपॉप्ड मखाना भी फीडिंग सिरे के पास अलग हो जाता है । यह मशीन 1 hp इलेक्ट्रिक मोटर द्वारा संचालित होती है और मशीन को संचालित करने के लिए 2 व्यक्तियों की आवश्यकता होती है। मशीन की अनुमानित लागत 1.5 लाख रुपये है।

टेबल–टॉप वैक्यूम फ्राइंग प्रणाली

पारंपरिक फ्राइंग की कमियों को जैसे कि अवांछनीय एक्रिलामाइड घटकों का निर्माण, उच्च वसा अवशोषण, फलों और सब्जियों के उत्पादों में अवांछित ब्राउनिंग, प्रयुक्त तेल की स्थिरता में कमी और पोषक तत्वों की हानि, आदि को ध्यान में रखते हुए टेबल–टॉप वैक्यूम फ्राइंग प्रणाली का एक कार्यात्मक प्रोटोटाइप विकसित किया गया है। प्रोटोटाइप की क्षमता 10 लीटर है। यह एक स्टेनलेस–स्टील से बना है। साथ ही फ्राइंग टोकरी को उठाने की भी व्यवस्था है। पारंपरागत तरीके से फ्राई किए आलू (160 डिग्री सेल्सियस 6 मिनट) की तुलना में वैक्यूम फ्राइड उत्पादों में कम वसा अवशोषित होता है तथा साथ ही इसका रंग और बनावट बेहतर होती है। फलों और सब्जियों के चिप्स के रंग और बनावट को बनाए रखने के लिए, इस विकसित प्रणाली का उपयोग तलने के लिए किया जा सकता है।

हैंडहेल्ड/हस्तचलित एन आईआर उपकरण

संवेदन प्रौद्योगिकियों में विकास और प्रगति ने निकट अवरक्त (एन.आई.आर) स्पेक्ट्रोमीटर को हैंड हेल्ड यन्त्र के रूप में लघु रूप दिया है, जिसका उपयोग गुणवत्ता नियंत्रण के लिए किया जा सकता है। इस उपकरण द्वारा मिलावटी नमूनों से शुद्ध बेसन को वर्गीकृत करने के लिए सपोर्ट वेक्टर मशीन वर्गीकरण मॉडल का भी विकास किया गया है। बेसन में मेटानिल येलो, खेसारी दाल, मटर और मक्के के आटे की मिलावट की मात्रा का पता लगाने के लिए अंशांकन विधियों को विकसित कर मान्य किया जा रहा है।

प्याज भंडारण संरचना के लिए वायु संशोधन इकाई

आन–फार्म (खेत पर) प्याज भंडारण संरचना से एकीकृत कर एक कम लागत वाली वायु संशोधन इकाई विकसित की गई है। विकसित प्रणाली का मूल्यांकन प्याज को 120 दिनों तक रखकर किया गया है। नतीजो में पाया गया कि विकसित तकनीक से प्याज के भंडारण में कम नुकसान हुआ जबकि साधारण भंडारण से प्याज के वजन में ज्यादा नुकसान पाया गया। कुल नुकसान (पीएलडब्ल्यू, स्पॉयलेज, अंकुरण हानि) 38.7% पाया गया। फार्म पर वायु संशोधन इकाई के उपयोग से प्याज के अंकुरण, वजन घटने से होने वाले नुकसान को, किसान 10–12% तक कम कर सकते हैं और लंबी अवधि के लिए प्याज की गुणवत्ता को बनाए रख सकते हैं।

प्रक्रियाएं प्रोटोकॉल/ मॉडल

मेटानिल येलो का पता लगाने के लिए एनआईआर स्पेक्ट्रोस्कोपी– आधारित अंशांकन मॉडल

बेसन में मेटानिल येलो (0.05% से 8.0%) की मिलावट की कम मात्रा का पता लगाने के लिये इन्फ्रारेड स्पेक्ट्रोस्कोपी– आधारित अंशांकन मॉडल में सुधार किया गया और पुनः एन.आई.आर. मॉडल विकसित किया गया है। एमपीएलएस, पीएलएस और पीसी प्रतिगमन विश्लेषण का उपयोग करते हुए विकसित मॉडलों में, एमपीएलएसआर मॉडल ने 0.045 के SEC और 0.169 के SECV के साथ R^2 का 1.0 मान दिखाया है। क्रॉस मान्यकरण के परिणामस्वरूप R^2 को 1.0 और SEP का मान 0.183 पाया गया। इस विधि द्वारा बेसन में 0.1% मेटानिल येलो की मिलावट का पता लगाया जा सकता है।

अश्वगंधा की जड़ों के लिए क्रायोजेनिक ग्राइंडिंग प्रक्रिया

क्रायोजेनिक ग्राइंडर (प्रयोगशाला मॉडल) की कार्यत्मक स्थितियों जैसे ग्राइंडिंग तापमान (–120 से –30 डिग्री सेल्सियस), ग्राइंडर की गति (2000–14000 आरपीएम) और नमी की मात्रा (6–12% w.b.) को प्रतिक्रिया सतह पद्धति (आर.एस.एम.) द्वारा अनुकूलित किया गया है। क्रायोजेनिक ग्राइंडिंग स्थितियों के माध्यम से प्राप्त अश्वगंधा पाउडर का कण आकार 0.321 मिमी (एम्बिएंट ग्राइंडिंग पर 0.623 मिमी की तुलना में) था, उसमें 93.99 मिलीग्राम/100 ग्राम एसेंशियल आयल, 798.99 (मिलीग्राम जीएई समतुल्य/100 ग्राम) कुल फिनोल पाया गया। क्रायोजेनिक रूप से पीसे गए अश्वगंधा की जड़ों के पाउडर का लागत–लाभ अनुपात 0.70% था।

सफेद मूसली की जड़ों के लिए क्रायोजेनिक ग्राइंडिंग प्रक्रिया

सफेद मूसली (*क्लोरोफाइटम बोरिविलिनम*) का जड़ एक ठोस और मुश्किल से पीसा जाने वाला पदार्थ है, इसलिए कण आकार और विशिष्ट ऊर्जा खपत को कम करने के लिए, सफेद मूसली के लिए क्रायोजेनिक ग्राइंडिंग के लिए प्रयोग किए गए हैं। संख्यात्मक अनुकूलन ने दर्शाया कि 8.79% नमी की मात्रा, –88 डिग्री सेल्सियस पीसने का तापमान और 8283 आरपीएम ग्राइंडर की गति, 0.87 वांछनीयता के साथ मूसली जड़ों के क्रायोजेनिक ग्राइंडिंग के लिए इष्टतम है। अनुकूलित और मान्य क्रायोजेनिक ग्राइंडिंग स्थितियों का उपयोग करके प्राप्त सफेद मूसली पाउडर का कण आकार 0.30 मिमी (परिवेश ग्राइंडिंग पर 0.623 मिमी की तुलना में) था, जिसमें 369.82 मिलीग्राम/100 ग्राम सैपोनिन सामग्री, 177.51 (मिलीग्राम जीएई समतुल्य/100 ग्राम) कुल फिनोल पाया गया। क्रायोजेनिक रूप से पिसी सफेद मूसली की जड़ों के पाउडर का लागत–लाभ अनुपात 0.69% था।

दलहनी बीटल से प्रभावित मूंग का माइक्रोवेव आधारित कीटाणुशोधन

मूंग को संक्रमित करने वाले ब्रुकिड्स (*कैलोसोब्रुकस मैक्यूलेटस*) के खिलाफ माइक्रोवेव विकिरण के प्रभाव का निरीक्षण करने के लिए एक अध्ययन किया गया है। अध्ययन में उपयोग किए गए माइक्रोवेव का स्रोत एक संवहन प्रकार का घरेलू

माइक्रोवेव ओवन (IFB 30SC®) है। प्रत्येक नमूने में (प्रत्येक 1 किग्रा) साठ वयस्क ब्रूकिड्स को मूंग में कृत्रिम रूप से संक्रमित किया गया और ब्रूकिड्स के विभिन्न चरणों जैसे अंडा, ग्रब, प्यूपा और वयस्क के विकास के लिए 10–15 दिनों के लिए रखा गए। अध्ययन से यह निष्कर्ष निकला कि विभेदक ताप, माइक्रोवेव एक्सपोजर के दौरान अनाज की गुणवत्ता में बदलाव किए बिना कीड़ों को मारता है।

कम कैलोरी वाले फलों के पेय पदार्थों के निर्माण के लिए प्रक्रिया प्रौद्योगिकी

विभिन्न कृत्रिम स्वीटनर (स्टीविया, सैकरिन, एस्पार्टेम और सुक्रालोज) के साथ चीनी (50–100%) को बदलने के लिए 10–12% सुक्रोज और 10% फल के गुदा/रस की सम–मीठी सांद्रता में आंवला और आम के फलों से कम कैलोरी पेय तैयार करने के लिए प्रक्रिया प्रौद्योगिकी को अनुकूलित किया गया है। बिना किसी अतिरिक्त लागत के, 50% कृत्रिम स्वीटनर के साथ सुक्रोज का प्रतिस्थापन कर समान स्वाद के साथ कम कैलोरी वाला (20–24 किलो कैलोरी/100 मिली) पेय पदार्थ जिसमे एस्कॉर्बिक एसिड (30–42 मिलीग्राम) की मात्रा के साथा तैयार किया गया है। 12% सुक्रोज युक्त पेय के बराबर मिठास के स्तर का उत्पादन करने के लिए आवश्यक स्वीटनर की अधिकतम मात्रा एस्पार्टेम और सुक्रालोज के लिए क्रमशः 64 मिलीग्राम और 20 मिलीग्राम पाई गई है। विकसित कम कैलोरी वाले फलों के पेय पदार्थों का क्रमशः साधारण परिवेश और कम तापमान की स्थिति में दो–छह महीने तक भंडारण किया जा सकता है।

लैकेस एंजाइम उत्पादन के लिए वन–फैक्टर–एट–ए–टाइम (ओएफएटी) तकनीक द्वारा सॉलिड स्टेट फर्मेंटेशन (एसएसएफ) स्थितियों का अनुकूलन

सॉलिड–स्टेट फर्मेंटेशन (SSF) हेतु क्रियात्मक मापदंडों के अनुकूलन के लिए वन–फैक्टर–एट–ए–टाइम (OFAT) दृष्टिकोण का उपयोग किया गया है। ओएफएटी प्रयोगों के दौरान ऊष्मायन समय (3–10 दिन), सब्सट्रेट की मात्रा (5–20 ग्राम), ऊष्मायन तापमान (20–40°C), सब्सट्रेट टू मोइस्चर (S:M) अनुपात (1:0.5–1:2.5) और इनोकुलम (1–5 डिस्क) रखा गया। क्रूड एंजाइम एक्सट्रेक्ट को उस दिन निष्कर्षण किया जाता है जिस दिन अधिकतम लैकेस एंजाइम की गतिविधि दिखाई देती है। ओएफएटी प्रयोगों के लिए अधिकतम लैकेस एंजाइम उत्पादन के लिए अनुकूलित स्थितियां ऊष्मायन समय (8 दिन), सब्सट्रेट मात्रा (10 ग्राम), ऊष्मायन तापमान (30 डिग्री सेल्सियस), एसः एम अनुपात (1:1.5) और इनोकुलम आकार (4 डिस्क) पाया गया है।

आम के ओस्मोटिक निर्जलीकरण से निकलने वाले सिरप अपशिष्ट का उपयोग कर सिरका उत्पादन की प्रक्रिया

ओस्मोटिक निर्जलीकरण किसी भी फल/उत्पाद के विटामिन, खनिज, रंग, और स्वाद को बनाए रखते हुए विभिन्न फलों के जिवानावधि को बढ़ाने के लिए सबसे अच्छा और उपयुक्त तरीका है। वर्तमान अध्ययन में आम के आसमाटिक निर्जलीकरण से निकलने वाले सिरप के कचरे का उपयोग करके सिरका बनाने की प्रक्रिया बनाई

गई है। प्रक्रिया में दो चरण शामिल हैं– अल्कोहल किण्वन और एसिटिक एसिड किण्वन। परिणामों से पता चला कि आम के आसमाटिक निर्जलीकरण से प्राप्त 1 लीटर सिरप कचरे से लगभग 2.5 लीटर सिरके का उत्पादन किया जा सकता है।

कोलेजन हाइड्रोलाइसेट का विशेषीकरण

पशु उद्योग के उप–उत्पादों से पारंपरिक रासायनिक निष्कर्षण विधियों के परिणामस्वरूप कम निष्कर्षण दक्षता के कोलेजन हाइड्रोलाइजेट (सीएच) होते हैं। इसलिए, एंजाइम–सहायता प्रक्रिया का उपयोग करके भैंस की त्वचा से तैयार सीएच का विशेषीकरण किया गया है। कोलेजन हाइड्रोलाईजेट का आणविक भार वितरण 30 से 65 केडीए तक पाया गया है जो उनके व्यावसायिक अनुप्रयोग के लिए अच्छा है। अंतिम उत्पाद में उच्च एंटीऑक्सीडेंट क्षमता पाई गई है। साईटोटोक्सिसिटी के संदर्भ में भी अंतिम सीएच उत्पाद को सुरक्षित पाया गया है। एक किलो सीएच प्राप्त करने के लिए लगभग 250/– रुपये का खर्च आता है। वहीं बैच स्तरीय प्रसंस्करण संयंत्र की स्थापना की लागत लगभग 15–20 लाख है।

अरहर की भूसी के फेनोलिक यौगिकों का स्प्रे ड्राइंग द्वारा माइक्रोएन्कैप्सुलेशन

41.80% जलीय इथेनॉल सांद्रता, 59^{0}C के निष्कर्षण तापमान और 6 घंटे निष्कर्षण समय के अनुकूलित स्थितियों के द्वारा प्राप्त अरहर की भूसी के (सीवी. पीएयू 881) फेनोलिक सत्त को स्प्रे ड्राइंग तकनीक की सहायता से माइक्रोएनकैप्सुलेट किया गया है। इसमें माल्टोडेक्सट्रिन के साथ गोंद अरेबीक (3:1) को कोटिंग एजेंट के रूप में उपयोग किया गया है। 1:4 के कोर टू कोटिंग एजेंट अनुपात में माल्टोडेक्सट्रिन और गम अरेबिक के साथ माइक्रो–एन्कैप्सुलेटेड स्प्रे ड्राइड नमूनों ने उच्चतम एनकैप्सुलेशन दक्षता दिखाई और क्रमशः 76.51, 10.53 और 20.60 का L*, a*, b* मान दिया।

काले सोयाबीन की किस्मों का जैव रासायनिक लक्षण वर्णन

ब्लैक सोयाबीन (BSB) एंथोसायनिन का एक समृद्ध स्रोत है और काले सोयाबीन की भारतीय किस्मों के महत्व को देखते हुए, चयनित किस्मों को रंग, संरचना और फैटी एसिड प्रोफाइल के लिए चित्रित किया गया है। क्रीम रंग की किस्म VLS–89 का L मान 60.36±0.3 था, भूरी किस्म 'रता भाट' के लिए यह 29.78±1.5 था और काली किस्म के लिए मूल्य 13.18±0.8 से 18.21±0.8 था। बीज की समीपस्थ संरचना से नमी, राख, प्रोटीन, वसा और विभिन्न किस्मों की कुल कार्बोहाइड्रेट सामग्री क्रमशः 11.27–13.01%, 3. 97–5.00%, 35.96–41.44%, 16.82–21.73% और 26.21–30.23% के बीच पाई गई। फैटी एसिड प्रोफाइल ने क्रमशः 9.25–10.81%, 2.48–3.99%, 20.05–36.03%, 42.07–58.11%, और 6.61–8.74% की सीमा में पामिटिक, स्टीयरिक, ओलिक, लिनोलिक और लिनोलेनिक एसिड दिखाया।

एंटी–ऑक्सीडेटिव एंजाइम और साइटोकिन्स की अभिव्यक्ति और स्राव पर अपरिपक्व सूखे किन्नू फल (आईडीकेएफ) के बायोएक्टिव सत्त का प्रभाव

अपरिपक्व सूखे किन्नू फल (IDKF) के क्रूड बायोएक्टिव एक्सट्रेक्ट की एंटी–ऑक्सीडेटिव क्षमता

का अध्ययन उसके क्रूड बायोएक्टिव सत्त और क्वेरसेटिन से ग्रस्त HT–29 कोशिकाओं में जीन (SOD और GPx) और प्रोटीन (IL–10 और TNF-α) स्तरों पर किया गया है । दोनों क्वेरसेटिन (50 mg/mL) और IDKF का क्रूड बायोएक्टिव सत्त (50 mg/mL) एक सामान परिस्थितियों में अनुपचारित नियंत्रण कोशिकाओं की तुलना में क्रमशः SOD की अभिव्यक्ति को 0.8 और 0.9–गुना से प्रेरित किया। IDKF के क्रूड बायोएक्टिव सत्त (50 mg/mL) और क्वेरसेटिन (50 mg/mL) ने अनुपचारित नियंत्रण कोशिकाओं की तुलना में IL–10 के स्राव को उत्त्रप्रेरित किया।

एचपीएलसी के माध्यम से आम के बीज की गुठली के अर्क में फेनोलिक्स और फ्लेवोनोइड्स का निर्धारण

आम के बीज की गुठली से प्रमुख फिनोलिक और फ्लेवोनोइड यौगिकों को अलग करने के लिए एचपीएलसी–आधारित विधि विकसित की गई है। मात्रात्मक विश्लेषण से पता चला है कि आम के बीज की गिरी में गैलिक एसिड, मैंगिफेरिन, रुटिन, फेरुलिक, सिनामिक एसिड और क्वेरसेटिन क्रमशः 137.80, 33.46, 453.95, 103.74, 14.87 और 4.21 मिलीग्राम /100 ग्राम की सांद्रता में होते हैं।

सहयोगात्मक/बाह्य वित्तपोषित परियोजनाएं

हवाईजर निर्माण यंत्रीकृत प्रणाली

हवाईजर को बनाने की पारंपरिक विधि का उपयोग करते हुए एक हवाईजर निर्माण यंत्रीकृत प्रणाली का विकास किया गया है। मशीनीकृत प्रणाली में भिगोना, उबालना और ऊष्मायन इकाई संचालन हैं। विकसित यंत्रीकृत प्रणाली (बैच टाइप) की क्षमता 10 किलोग्राम है। प्रणाली को अधिकतम पारिचालित तापमान 125^{0}C और 2.0 बार के दबाव के साथ विकसित किया गया है।

परिवहन के दौरान केले की मार्गन एवं अनुरेखण हेतु सेंसर आधारित प्रणाली

परिवहन के दौरान केले की मार्गन एवं अनुरेखण हेतु एक सेंसर–आधारित प्रणाली विकसित की जा रही है, जो केले की जीवनावधि, गुणवत्ता और सुरक्षा को बनाए रखने में मदद करेगी। यह प्रोटोटाइप में तापमान और आरएच सेंसर एवं जीपीएस के साथ एकीकृत है जो –40 से 80^{0}C की सीमा में तापमान की भिन्नता को, और आरएच को 0 से 100% की सीमा के भाव में सक्षम है। प्रणाली में जीपीएस के माध्यम से केले के परिवहन के दौरान उसके स्थान का पता किया जा सकता है।

मशीन विजन कैमरा आधारित आम की ग्रेडिंग के लिए प्रोटोकॉल

आम के रंग और आकार के आधार पर वर्गीकरण हेतु मशीन विजन कैमरे के लिए एक प्रोटोकॉल विकसित किया गया है जिससे चार अलग–अलग ग्रेड प्राप्त किए जा सकते हैं। सिस्टम में मुख्य तीन घटक हैं जैसे सेंसर, इंटरफेस, कनेक्टर्स और रोशनी प्रणाली। PLC (डेल्टा मेक 12SA2) का उपयोग करके एक लैडर लॉजिक प्रोग्राम विकसित किया गया है।

रोबोट हारवेस्टर के लिए एआई आधारित सेब को पहचान का प्रोटोकाल

प्राकृतिक प्रकाश की विभिन्न स्थितियों के तहत वास्तविक दुनिया के जटिल वातावरण में सेब की पहचान और पता लगाने के लिए आर्टिफिशियल इंटेलिजेंस–आधारित सेब पहचान प्रोटोकॉल विकसित किए गए हैं। वास्तविक समय में फलों का पता लगाने और स्थानीयकरण के लिए वन–स्टेज (YOLO) और टू–स्टेज (RNN) आधारित ऑब्जेक्ट डिटेक्शन मॉडल विकसित किए गए हैं। YOLO मॉडल के विभिन्न संस्करणों (v3, v4, v5, v6 और v7) को डेटासेट के सबसेट का उपयोग करके प्रशिक्षित किया गया है। YOLO v5 और v7 सभी श्रेणियों की छवियों (जैसे पेड़ के छायादार हिस्से, पेड़ के धूप वाले हिस्से और पत्तियों के नीचे छिपी वस्तुओं वाली छवि) पर बेहतर प्रदर्शन करते हैं।

भण्डारित अनाज के कीट–पतंगों की अलग–अलग रंग की रोशनी के प्रति प्रतिक्रिया

अनाज भंडारण परिसर में कीट–पतंगों को आकर्षित करने और पकड़ने के लिए रोशनी का उपयोग किया जा सकता है। कीट–पतंगों के इस फोटोटैक्टिक व्यवहार का फायदा उठाने के लिए एक अध्ययन किया गया है और मोनोक्रोमेटर (Marutek XM-100®) और स्पेक्ट्रोमास्टर (सेकोनिक C-700®) जैसे उपकरणों का उपयोग किया गया है। तीन पतंगों क्रमशः चावल के पतंगों, धान के पतंगों और बादाम के पतंगों का फोटोटैक्टिक व्यवहार दर्ज किए गए। वोल्टेज और तीव्रता में उतार–चढ़ाव करके ट्रैपिंग को अनुकूलित किया गया है। इन परिणामों के आधार पर, लुधियाना में तीन अलग–अलग स्थानों पर आटा मिलों में प्रोटोटाइप लगाए गए हैं।

उत्पादन क्षेत्र में शहद के प्रसंस्करण और मूल्यवर्धन हेतु प्रोत्साहन

अर्ध–स्वचालित शहद प्रसंस्करण इकाई का उपयोग करके गुणवत्ता वाले शहद के प्रसंस्करण और विपणन के लिए धुरी, संगरूर, पंजाब के, 20 मधुमक्खी पालकों का एक किसान हित समूह बनाया गया है। शहद उत्पादन को बढ़ाने के लिए समूह को 200 मधुमक्खी बक्से भी वितरित किए गए हैं। मशीनीकृत प्रसंस्करण और शहद की पैकेजिंग को बढ़ावा देने के लिए केवीके, बठिंडा, पंजाब में 34 मधुमक्खी पालकों के साथ एक किसान–वैज्ञानिक इंटरफेस बैठक भी आयोजित की गई है।

एआईसीआरपी–पीएचईटी द्वारा विकसित मशीनरी/ प्रक्रियाएं/उत्पाद

एआईसीआरपी–पोस्ट–हार्वेस्ट इंजीनियरिंग एंड टेक्नोलॉजी (पीएचईटी) ने विभिन्न मशीनें, उत्पाद और प्रक्रिया प्रोटोकॉल विकसित किये हैं, जिनमें एरेका नट डी–हस्किंग और पीलिंग औजार, सौर ताप और कीट जालप्रणाली के साथ अनाज के लिए भंडारण बिन, मूंगफली की फलियों के लिए माइक्रो– क्लाइमेट स्टोरेज बिन, कोकोआ बटर एक्सट्रैक्टर, खाद्य रोगजनकों के कीटाणुशोधन के लिए निरंतर प्रकार की यूवी–सी उपचार इकाई, नैनो–सिल्वर और नैनो–जिंक मिश्रित सक्रिय पैकेजिंग सामग्री और फॉक्सटेल बाजरा आधारित इंस्टेंट उपमा मिक्स तैयार करने के लिए प्रक्रिया आदि शामिल हैं।

एआईसीआरपी–पीईएएसईएम द्वारा विकसित मशीनरी/ प्रक्रियाएं/उत्पाद

एआईसीआरपी–कृषि संरचनाओं और पर्यावरण प्रबंधन में प्लास्टिक इंजीनियरिंग (पी.ई.ए.एस.ई.एम.) द्वारा किए गए विकास में भेड़ के लिए पशु आश्रय का संशोधित डिजाइन, फूलगोभी के बेमौसमी उत्पादन तथा बरसात के मौसम में मल्चिंग के साथ संरक्षित खेती के लिए प्रौद्योगिकी, मध्य– समशीतोष्ण क्षेत्र में साल भर मशरूम उत्पादन के लिए पॉलीहाउस, संशोधित वाष्पीकरणीय ठंडा कक्ष, याक और चरवाहों के लिए पोर्टेबल आश्रय, बांस पॉलीहाउस, ऑटोमेटेड प्लांट फैक्ट्री प्रोटोटाइप, बकरियों की सभी नस्लों के लिए उपयुक्त प्लास्टिक–आधारित हैंगिंग टाइप फीडर का विकास, स्वचालित छायांकन प्रणाली, आदि शामिल हैं ।

सीआरपी–एसए द्वारा विकसित मशीनरी/ प्रक्रियाएं/उत्पाद

उच्चतर कृषि प्रसंस्करण (एसए) पर सीआरपी ने विभिन्न मशीनें, उत्पाद और प्रक्रिया प्रोटोकॉल विकसित किए हैं जिनमें कच्चे मखाना बीज संग्रह प्रणाली, इमली के बीज से स्टार्च और प्रोटीन का निष्कर्षण, भुने हुए मखाना बीजों के लिए भंडारण प्रोटोकॉल आदि शामिल हैं।

अन्य पेशेवर उपलब्धियां

वर्ष 2022 में हमारे वैज्ञानिकों को कटाई–उपरांत अनुसंधान और विकास में उनके योगदान के लिए कई पुरस्कारों (मौखिक/पोस्टर प्रस्तुति पुरस्कार) से सम्मानित किया गया है। हमारे वैज्ञानिक विभिन्न समितियों और वैज्ञानिक पैनल के सदस्य भी हैं। 2022 के दौरान सात प्रौद्योगिकियों को लाइसेंस दिया गया जिसमें जीवित मछली वाहक प्रणाली और जीवित मछली के परिवहन की विधि, तिलहन केक से प्रोटीन आइसोलेट के उत्पादन के लिए माइक्रोबियल विधि, गुणवत्ता वाले प्रोटीन मक्का–आधारित ग्लूटन मुक्त मफिन की प्रक्रिया, जामुन बार तैयार करने की प्रक्रिया, माइक्रोकैप्सूल के स्वच्छ उत्पादन के लिए मल्टीस्टेज ब्रेकअप के साथ ऑटोक्लेवेबल माइक्रोएन्कैप्सुलेशन प्रणाली, सेमी–पॉप्ड मखाना के साथ अनाज–ग्लूटेन मुक्त पास्ता, टारो छीलने की मशीन। प्रौद्योगिकी लाइसेंसिंग के जरिये 8.62 लाख रुपये का राजस्व अर्जित किया गया। रिपोर्ट की गई अवधि के दौरान संस्थान को पांच पेटेंट भी प्राप्त हुए।

संस्थान के पोस्ट–हार्वेस्ट मशीनरी एंड इक्विपमेंट टेस्टिंग सेंटर (PHMETC) ने देश के विभिन्न हिस्सों से आई 79 मशीनों का परीक्षण किया, जिससे कुल रु. 1,42,53,957 (एक करोड़ बयालीस लाख तिरेपन हजार नौ सौ सत्तावन) का राजस्व उत्पन्न हुआ है।

वर्ष 2022 के दौरान, विभिन्न योजनाओं के तहत विभिन्न उद्यमिता विकास कार्यक्रम, मानव संसाधन विकास कार्यक्रम, किसान प्रशिक्षण, छात्र प्रशिक्षण आदि आयोजित किए गए। विभिन्न स्थानों के 250 से अधिक छात्रों और 1200 नवोदित उद्यमियों को उद्यमिता विकास कार्यक्रमों (ईडीपी), किसानों के प्रशिक्षण और संवेदीकरण कार्यक्रमों के माध्यम से कृषि और पशुधन उत्पादन के फसलोत्तर प्रबंधन के लिए प्रशिक्षित किया गया।

आजादी का अमृत महोत्सव के अंतर्गत संस्थान ने विभिन्न कार्यक्रमों जैसे 'फिश वेस्ट से बायोएक्टिव पेप्टाइड', 'न्यूट्रास्यूटिकल्स का माइक्रोएन्कैप्सुलेशन', 'खाद्यान्नों का माइक्रोवेव डिसइन्फेक्शन', किसान भागीदारी–प्राथमिकता हमारी, पर राष्ट्रीय वेबिनार श्रृंखला, श्रीअन्न आधारित खाद्य उत्पादों पर वर्कशॉप, माइक्रोबायो–लॉजिकल और बायोकेमिकल तकनीकों पर ऑनलाइन सर्टिफिकेट कोर्स, आजादी के 75 साल–फिटनेस रहे बेमिसाल के साथ योग कार्यक्रम और राष्ट्रीय बालिका दिवस आदि पर विभिन्न जागरूकता अभियान एवं कार्यक्रमों का आयोजन किया गया। भा.कृ.अनु.प.–सीफेट, लुधियाना ने अपना स्थापना दिवस मनाने के लिए कृषि प्रसंस्करण पर उद्योग इंटरफेस मेला–2022 (सीफेट– आईफा 2022) का भी आयोजन किया। वर्ष के दौरान राष्ट्रीय और अंतरराष्ट्रीय समकक्ष समीक्षा पत्रिकाओं में उच्च गुणवत्ता वाले 45 से अधिक शोध पत्र प्रकाशित हुए।

संस्थान के प्रमुख प्रकाशनों में बागवानी उद्यमियों के लिए पीएचएम–कोल्ड रूम, कोल्ड स्टोरेज, राइपनिंग चेंबर और रीफर–वैन में उद्यमिता विकास कार्यक्रम पर सार–संग्रह, इन्फ्रारेड स्पेक्ट्रोस्कोपी और केमोमेट्रिक्स का उपयोग करके बेसन में मिलावट का पता लगाने, मक्के के दानों को सुखाने और भंडारण के तरीके, मछली के कचरे से एंटीहाइपरटेंसिव (एसीई– इनहिबिटरी) पेप्टाइड्स, भारत के लिए कृषि–प्रसंस्करण मॉडल, फसल अवशेष–आधारित निर्माण ईंटें पर प्रकाशित तकनीकी बुलेटिन शामिल हैं। संस्थान के अन्य प्रकाशनों में संग्रह पुस्तक, पुस्तक अध्याय, लोकप्रिय तकनीक लेख, वार्षिक रिपोर्ट, समाचार पत्र और पत्रिका शामिल हैं।

Executive Summary

ICAR-CIPHET, a premier institute in the country with a mandate to undertake research activities in post-harvest engineering and technology. During 2022, the institute continued to play a significant role in developing innovative technologies, methodologies related to post-harvest processing and quality management and further transferring these technologies to respective stakeholders such as farmers, entrepreneurs and industries through technology licensing, trainings, capacity building and extension activities. Institute has contributed through its various multidisciplinary in-house and externally funded research projects; the institute has developed innovative solutions for the problems posed by various stakeholders. The salient achievements of ICAR-CIPHET during the year 2022 are summarized here.

Machines/Equipment Developed

Photoreactor for ethylene degradation

A photoreactor for ethylene degradation, to meet the challenge of ethylene management in the supply chain, has been developed. The photoreactor is novel in terms of photoreactor design, TiO_2 coating, and application of both photocatalytic and photochemical oxidation techniques in ethylene management for perishables. The installation of the photoreactor(s) in the storage facility is expected to enhance the shelf life of bananas by 1.5-2 folds.

IoT-based real-time monitoring system for cold storage

An IoT-based modular system to remotely monitor the microclimate parameters, *i.e.*, temperature, relative humidity, O_2, and CO_2 within the cold storage room has been designed, developed, and implemented in the onion cold storage. The real-time values of parameters are displayed in the web dashboard of the IoT platform. This system represents a complete monitoring system for the parameters inside cold storage.

Buckwheat dehuller

Dehuller for buckwheat dehulling, having a capacity of 40 kg/h, with a power consumption of 1.25 kWh has been developed. Unhulled and dehulled grains are collected in separate channels. The machine has 67% dehulling efficiency at low seed moisture ($\leq$6% wb) in a single pass with less than 6% broken. The approximate cost of machine is Rs. 40,000/-.

Popped makhana grading machine

A simple and compact grading machine with a capacity of 200 kg popped makhana per hour has been developed for grading of popped makhana in different sizes (12-15 mm, 15-19 mm and >19 mm diameters). The grader also separates flattened and unpopped makhana near the feeding end. This machine is operated by 1 hp electric motor and 2 unskilled persons are required to operate the machine. Tentative cost of the machine is Rs. 1.5 lakh.

Table-top vacuum frying system

In order to address the limitations of conventional frying (formation of undesirable components like acrylamide, high fat absorption, undesirable browning in fruits and vegetables products, reduced stability of used oil and loss of nutrients), a functional prototype of table-top vacuum frying system has been developed. The prototype has a stainless-steel vessel of 10 litres capacity and equipped with a lifting mechanism attached to the frying basket. Vacuum fried products exhibited reduced fat absorption, improved colour and texture in comparison to conventional potato fries (160 °C for 6 minutes). The devel-oped system can suitably be used for frying of fruits and vegetables chips while maintaining the colour and texture.

Handheld NIR instrument

The development and advances in sensing technologies have led to miniaturization of near infrared (NIR) spectrometers in the form of portable handheld equipment which can be used for quality control purposes. In this sense, handheld NIR Instrument was designed and got fabricated. Support vector machine classification model is also developed to classify pure *besan* from adulterated samples. Calibration methods for quantitative detection of adulterants *viz*. metanil yellow, *khesari*, pea and maize flour in *besan* have been developed and are being validated.

Air modification unit for Onion storage structure

A low-cost air modification unit has been developed to integrate it with the on-farm onion storage structure. System is evaluated for 120 days with load of onions; physiological loss of weight was observed higher (16%) at ambient conditions than in the onion storage structure (11%). Germination loss is 6.8 % and 3.5 % at the respective conditions. Total loss (PLW, spoilage and germination loss) is about 38.7 % and 26.3% in ambient conditions and onion storage structure, respectively. The farmers using the air modification unit on the farm can reduce 10-12 % losses of onions by spoilage, germination, and weight loss and can maintain the quality of onions for a longer period.

Processes/Protocols/Models

Near infrared spectroscopy-based calibration model for detection of metanil yellow

To improve the model for detection of lower amounts of adulterant, near infrared spectroscopy-based calibration model for detection of metanil yellow (0.05% to 8.0%) in *besan* flour has been developed. Among the developed models using MPLS, PLS and PC regression analysis, MPLSR model showed R^2 of 1.0 with SEC of 0.045, and SECV of 0.169. Cross validation resulted in R^2 as 1.0 and SEP of 0.183. The method can detect 0.1% of metanil yellow adulteration in *besan*.

Cryogenic grinding process for ashwagandha roots

The cryogenic grinding conditions of the cryogenic grinder (lab model) have been optimized for grinding temperature (-120 to -30 °C), grinder speed (2000-14000 rpm), and moisture content (6-12% w.b.) using response surface methodology. The particle size of ashwagandha powder, obtained using optimized and validated cryogenic grinding conditions was 0.321mm (as compared to 0.623 mm at ambient grinding), with 93.99 mg/100g essential oil, 798.99 mg (GAE equivalent/100g) total phenols, the specific energy consumption of 1.496 kWh/kg and color difference as 1.54. The cost-benefit ratio of cryogenically ground ashwagandha roots powder was 0.70.

Cryogenic grinding process for safed musli roots

Safed musli (*Chlorophytum borivilinum*) root is a hard-to-grind material, so to minimize the particle size and specific energy consumption, experiments were conducted for cryogenic grinding of safed Musli. The numerical optimization indicated that 8.79% moisture content, 88 °C of grinding temperature and 8283 rpm grinder speed is optimum for cryogenic grinding of safed musli roots with 0.87 desirability. The particle size of safed musli powder obtained using optimized and validated cryogenic grinding conditions was 0.30 mm (as compared to 0.623mm at ambient grinding), with 369.82 mg/100g saponin content, 177.51 mg (GAE equivalent/100g) total phenols, the specific energy consumption of 1.87 kWh/kg and colour difference as 1.267. The cost-benefit ratio of cryogenically ground safed musli roots powder was 0.69.

Microwave based disinfestation of green gram infested with pulse beetle (Callasobruchus maculatus)

A study has been carried out to observe the effect of microwave radiations against bruchids (*Callosobruchus maculatus*), infesting green gram. The source of microwave used in the study is a convection type domestic microwave oven (IFB 30SC®) with rotating table having 30 l capacity and MW Power output of 900-watt. Sixty adult bruchids per each sample (1 kg each) were artificially infested to green gram and kept for 10-15 days for growth of different stages of bruchids *i.e.*, egg, grub, pupa, and adult. The study concludes that differential heating during microwave exposure kills the insects without altering the grain quality.

Process technology for preparing low calorie fruit beverages

Process technology has been optimized for preparing low calorie beverages from aonla and mango fruits to replace sugar (50-100 %) with different artificial sweetener (stevia, saccharin, aspartame and sucralose) in equi-sweet concentration of 10-12% sucrose and 10% fruit pulp/juice. Replacement of sucrose with 50% artificial sweetener produced self-stable beverages with identical taste, good ascorbic acid content (30-42 mg) and reduced calorie values (20-24 kcal/100ml) at no extra cost compared to those prepared with sucrose only (49.06 kcal/100ml).The optimum amount of sweetener required to produce a sweetness level equal to that of a beverage containing 12% sucrose is found to be 64 mg and 20 mg, respectively for aspartame and sucralose. Storability of the developed low calorie fruit beverages varies from two months to six months under ambient and low temperature conditions, respectively.

Optimization of solid-state fermentation (SSF) conditions by one-factor-at-a-time (OFAT) approach for laccase enzyme production

One-Factor-at-a-Time (OFAT) approach has been utilized for optimization of physiological parameters for Solid-state fermentation (SSF). The sequential order of OFAT experimental, variable and fixed factors, levels of variable factors, growth condition provided during OFAT experiment and harvesting of samples for enzyme assay are incubation time (3-10 days), substrate amount (5-20g), incubation temperature (20-40°C), substrate to moisture (S:M) ratio (l:0.5- 1:2.5) and inoculum size (1- 5 disc). The harvesting of crude extract is done on the day that showed maximum laccase enzyme activity. Optimized conditions for maximum laccase enzyme production for OFAT experiments are incubation time (8 days), substrate amount (10g), incubation temperature (30°C), S:M ratio (1:1.5) and inoculum size (4 disc).

Process for vinegar production using syrup waste from osmotic dehydration of mango

Osmotic dehydration is one of the best and suitable method to increase the shelf life of various fruits while retaining vitamins and minerals, color, flavour and taste of the product. The present study reports process to produce vinegar using the syrup waste from osmotic dehydration of mango. The process involves two steps- alcoholic fermentation and acetic acid fermentation. The results showed that about 2.5 litres of vinegar is produced from 1 litre of syrup waste obtained from osmotic dehydration of mango.

Characterization of collagen hydrolysate (CH)

The conventional chemical extraction methods of collagen hydrolysates (CH) result in lower extraction efficiency with poor quality from animal industry by-products. Therefore, CH from buffalo skin has been prepared using an enzyme-assisted process and characterized. The molecular weight distribution of collagen hydrolysates ranged from 30 to 65 kDa which is good for their commercial application. The final product has high antioxidant capacity. CH product is found to be safe in terms of cytotoxicity as revealed during the MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium bromide) assay for assessing cell metabolic activity. Total expenditure to obtain one kg of CH comes around Rs. 250/- and the cost of establishment of batch level processing plant is approximately Rs. 15-20 lakh.

Microencapsulation of pigeon pea husk phenolic compounds using spray drying

The phenolic extract of pigeon pea (cv. PAU 881) husk obtained under the optimized conditions of 41.80% aqueous ethanol concentration, 59°C extraction temperature and 6h extraction time, has been microencapsulated using maltodextrin and maltodextrin with gum arabic (3:1) as coating agent with the spray drying technique. The spray dried samples microen-capsulated with maltodextrin and gum arabic in a core to coating agent ratio of 1:4 showed the highest encapsulation efficiency and gave L*, a*, b* value of 76.51, 10.53 and 20.60, respectively.

Biochemical character-ization of black soybean varieties

Black soybeans (BSB) are rich source of anthocyanins and considering the importance of Indian black seed varieties of soybean, selected colored varieties have been characterized for color, proximate composition, and fatty acid profile. L values of cream-colored variety VLS-89 was 60.36±0.28, for Brown variety 'Rata Bhat' it was 29.78±1.54 and for black varieties value ranged from 13.18 ±0.76 to 18.21±0.76. Proximate composition of seed revealed moisture, ash, protein, fat and total carbohydrate content of different varieties ranged from 11.27-13.01%, 3.97-5.00%, 35.96-41.44, 16.82-21.73% and 26.21-30.23%, respect-ively. Fatty acid profile showed palmitic, stearic, oleic, linoleic and linolenic acid in the range of 9.25-10.81%, 2.48-3.99%, 20.05-36.03%, 42.07-58.11%, and 6.61-8.74%, respectively.

Effect of immature dried kinnow fruit (IDKF) crude bioactive extract on expression and secretion of anti-oxidative enzyme and cytokines

Anti-oxidative potential of crude bioactive extract of Immature Dried Kinnow Fruit (IDKF) has been studied at gene (SOD and GPx) and protein (IL-10 and TNF-á) levels in HT-29 cells challenged with crude bioactive extract of IDKF and quercetin. Both quercetin (50 mg/mL) and crude bioactive extract of IDKF (50 mg/mL) under similar conditions induced the expression of SOD by 0.8 and 0.9-fold, respectively in comparison to untreated control cells. The crude bioactive extract of IDKF (50 mg/mL) and quercetin (50 mg/mL), both induced secretion of IL-10 in comparison to untreated control cells.

Determination of phenolics and flavonoids in mango seed kernel extract using HPLC

HPLC-based method has been developed for separating major phenolic and flavonoid compounds from mango seed kernels. The quantitative analysis revealed that the mango seed kernel possesses gallic acid, mangiferin, rutin, ferulic, cinnamic acid, and quercetin in the concentration of 137.80, 33.46, 453.95, 103.74, 14.87 and 4.21 mg/100g, respectively.

Collaborative/Externally funded projects

Development of hawaijar making mechanized system

A *hawaijar* making system is developed involving the traditional method of making *hawaijar*. The unit operations considered in the mechanized system are soaking, steaming and incubation. The designed capacity of the developed mechanized batch type system is 10 kg. The system has been developed with maximum operating temperature and pressure of 125°C and 2.0 bar, respectively.

Sensor-based system for tracking and tracing of banana during transportation

A sensor-based system for tracking and tracing of banana during transportation is being developed, which will help in maintaining shelf life, quality, and safety of banana. Sample prototype is integrated with temperature and RH sensor, GPS) capable of measuring temperature variation in the range -40 to 80 °C and RH changes in the range of 0 to 100%. GPS features of the system allows to track the location of transporting containers carrying the banana.

Protocol for machine vision camera-based grading of mango

A protocol for machine vision camera based on the color and size of the mango has been developed to get four different grades. The system has main three components *viz*. sensors, interface and connectors and illumination system. A ladder logic programme is developed using PLC (Delta make 12SA2).

AI based apple detection and localization model for robotic harvester

Artificial intelligence-based apple identification protocols have been developed to identify and detect apples in a real-world complex environment under different conditions of natural lighting. One-stage (YOLO) and two-stage (RNN) based object detection models have been developed for detection and localization of fruits in real time. Different versions of YOLO model (v3, v4, v5, v6 and v7) trained using subsets of datasets. YOLO v5 & v7 outperforms detection on all categories of images (like image containing shady side of tree, sunny side of tree and hidden objects under leaves).

Response of stored grain moths to different colored lights

Light can be used for attraction and trapping of the insects in the grain storage premises. A study has been conducted to exploit the phototactic behaviour of moths towards devices like monochromator (Marutek XM-100®) and spectromaster (Sekonic C-700®). The phototactic behaviour of three moths *viz*., rice moth, paddy moth and almond moth were recorded. By fluctuating the dependent variables like voltage and intensity the trapping was optimized. Based on these results, the prototypes have been developed and installed in flour mills at three different locations at Ludhiana, along with the conventional UV light trap.

Promoting processing and value addition of honey at production catchment

A farmer interest group of 20 beekeepers of Dhuri, Sangoor, Punjab has been created for processing and marketing of quality honey using semi-automatic honey processing unit. To scale up the honey production, 200 honeybee boxes were also distributed to the group. A farmer-scientist interface meeting with 34 beekeepers has also been organized at KVK, Bathinda, Punjab for promoting mechanized processing and packaging of honey.

Machineries/Processes/Products Developed by AICRP-PHET

The AICRP on Post-Harvest Engineering and Technology (PHET) has developed various machines, products and process protocols, a few of which includes arecanut de-husking and peeling tool, storage bin for grains with an insect trap & solar heating system, micro-climate storage bin for groundnut pods, cocoa butter extractor, continuous type UV-C treatment unit for disinfection of food pathogens, nano-silver and nano-zinc compounded active packaging material, *dal* insect analogues from pigeon pea *dal* brokens & process technology for the preparation of foxtail millet based instant *upma* mix.

Machineries/Processes/Products Developed by AICRP-PEASEM

Some of the major developments made by AICRP on Plastic Engineering in Agriculture Structures & Environment Management (PEASEM) includes modified design of animal shelter for sheep, technology for off-season production of cauliflower in protected cultivation with mulching during rainy season, phase change material based assembled type fruit ripening chamber, polyhouse for round the year mushroom production in mid-temperate region, modified evaporative cooled chamber, portable shelter for yak and herders, bamboo polyhouses, automated plant factory prototype, development of plastic-based hanging type feeders suited for all breeds of goats, automatic shading system, etc.

Machineries/Processes/Products Developed by CRP on SA

The CRP on secondary agriculture (SA) has developed various machines, products and process protocols which includes raw *makhana* seed collection system, extraction of starch and protein from tamarind seeds, storage protocol for roasted *makhana* seeds.

Other Professional Achievements

Our scientists are conferred with many awards and honours (including oral/poster presentation award) in recognition of their contributions in research and development in post-harvest sector. Our scientists are also members of various committees and scientific panels. Seven (07) technologies were licensed during 2022 which include live fish carrier system and method of transporting live fish, microbial method for production of protein isolate/ concentrate from oilseed cakes/meals, process for quality protein maize-based gluten free muffins, jamun bar preparation process, autoclavable microen-capsulation system with multistage breakup two fluid nozzle for clean production of microcapsules, cereal-gluten free pasta with semi-popped makhana, taro peeling machine. The technology licensing generated a revenue of Rs. 8.62 lakh during the year. Five (05) patents were granted during the reported period. The Post-Harvest Machinery and Equipment Testing Centre (PHMETC) tested 79 machines from different parts of the country, earning a total revenue of Rs. 1.42 Crore.

During the reported period, various Entrepreneurship Development Programmes, Human Resource Develop-ment programmes, farmer's training, student's trainings etc. were organized under different schemes. More than 150 students and 1200 budding entrepreneurs from different places were trained for post-harvest management of agricultural and livestock produce through entrepreneurship development programs (EDP), farmers' trainings, and sensitization programmes. Under Azaadi Ka Amrut Mahotsav, ICAR-CIPHET has organised various programmes; e.g. National webinar series (04) on 'Bioactive Peptide from Fish Waste', 'Microencapsulation of Nutraceuticals', 'Microwave Disinfestation of Food Grains', किसान भागीदारी–प्राथमिकता हमारी, workshop on Millets based Food Products, Online Certificate Course on Microbiological and Biochemical Techniques Used in Industries , awareness campaign/event on Azadi Ke 75 Saal Fitness Rahe Bemisaal with Yoga Program & National Girl Child Day etc. ICAR-CIPHET, Ludhiana has also organized Industry Interface Fair on Agro processing – 2022 (CIPHET-IIFA 2022) to commemorate its foundation day.

More than 45 research papers were published in high quality national and international peer reviewed journals. The other major publications of the institute include compendium on 'Entrepreneurship Development Programme in PHM-cold room, cold storage, ripening chamber and reefer-van for horticulture entrepreneurs', technical bulletins on 'Rapid adulteration detection in chickpea flour (*besan*) using infrared spectroscopy and chemometrics', Drying and storage practices of maize cobs and grains, Antihypertensive (ACE-inhibitory) peptides from fish waste, Agro-processing models for India, Crop residue-based construction bricks, annual reports, newsletters, and leaflets.

Vision & Mission

Achieving near zero post-harvest losses and high level of processing of agricultural commodities through excellence in research

- Evolving efficient post-harvest engineering and technological interventions to enhance farmers income by transforming farmers and rural youth into entrepreneurs, providing products with quality and safety assurance to consumers, addressing environmental protection issues as well as acting as referral point for policy inputs, defining standards and networking with sister organizations to harness synergies for solving problems in post-harvest sector

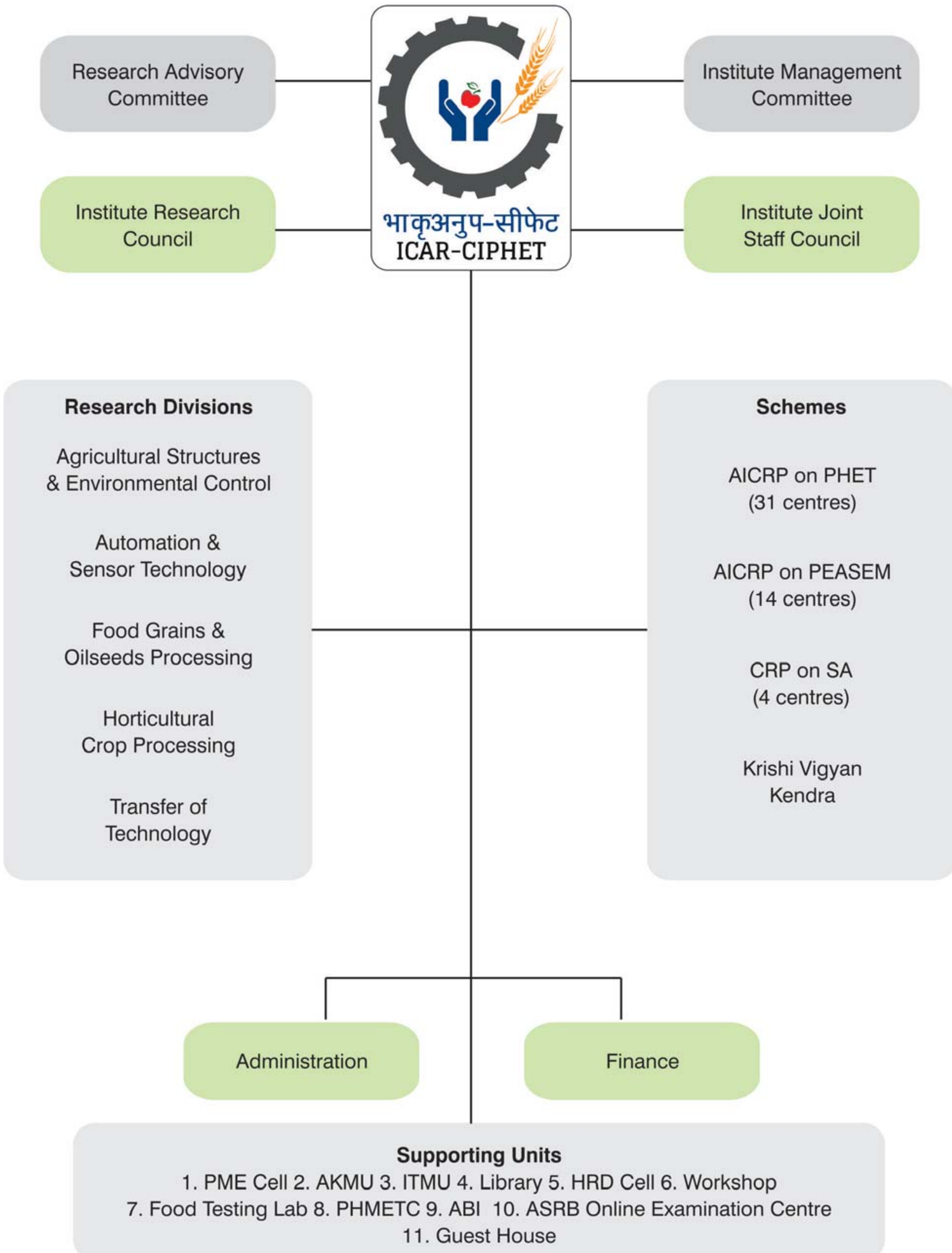
- Higher profitability of agricultural production systems ensuring better income to farmers and increased employment opportunities in rural sector through efficient post-harvest engineering and technological interventions for loss reduction and value addition to agricultural produce and by-products resulting in high quality and safe food and feed at competitive prices for domestic and export markets

Mandate

Research for solving problems and identifying technologies related to post-harvest loss assessment and prevention, processing, value addition and storage of agricultural, horticultural, livestock and aquaculture produce targeted to achieve food safety and quality assurance

Human resource and entrepreneurship development in post-harvest engineering and technology

Organogram


Research Advisory Committee
Institute Management Committee
भाकृअनुप-सीफेट
ICAR-CIPHET
Institute Research Council
Institute Joint Staff Council
Research Divisions
Agricultural Structures & Environmental Control
Automation & Sensor Technology
Food Grains & Oilseeds Processing
Horticultural Crop Processing
Transfer of Technology
Schemes
AICRP on PHET (31 centres)
AICRP on PEASEM (14 centres)
CRP on SA (4 centres)
Krishi Vigyan Kendra
Administration
Finance
Supporting Units
1. PME Cell 2. AKMU 3. ITMU 4. Library 5. HRD Cell 6. Workshop
7. Food Testing Lab 8. PHMETC 9. ABI 10. ASRB Online Examination Centre
11. Guest House

Overview

ICAR-Central Institute of Post-Harvest Engineering and Technology (ICAR-CIPHET) was established on 03 October 1989, Ludhiana, Punjab. It is a nodal institute that undertakes lead research in the post-harvest engineering and value addition technologies appropriate to agricultural production catchments and agro-processing industries. Another campus of the Institute was established on 19 March 1993 at Abohar, Punjab, to primarily undertake research and development activities for processing and value addition of fruits, vegetables, and horticultural crops. ICAR-CIPHET is also headquarter of two All India Coordinated Research Projects (AICRPs) *viz*. AICRP on Post-Harvest Engineering and Technology (PHET) with 31 Centres and AICRP on Plastic Engineering in Agriculture Structures & Environment Management (PEASEM) with 14 Centres across the country. ICAR-CIPHET is the only institute in India which works entirely for applied post-harvest technology and value addition of all commodities for farmers, orchardists, rural youth, and entrepreneurs directly as well as generates basic knowledge by taking various basic and strategic research projects in the mandated areas.

The institute has five divisions:

1. Agricultural Structures and Environmental Control
2. Automation and Sensor Technology
3. Food Grains and Oilseeds Processing
4. Horticultural Crop Processing (Abohar)
5. Transfer of Technology

The institute has developed nearly 140 technologies including several equipment for food processing, structures for safe handling and shelf-life enhancement of farm produce, process protocols for value added products, novel products and technologies for farmers and processors. Out of theses developed technologies, 80 technologies have been licensed/ commercialized to about 169 entrepreneurs/end users. The technologies

developed by ICAR-CIPHET helped the farming community in reducing post-harvest losses, value addition to the farm produce, development of functional foods and food safety through interventions in the arena of protected cultivation, threshing, milling, processing, improved storage, preservation, non-destructive quality evaluation, enhancement of shelf life for crops and livestock produce and by-product utilization. These technologies have helped the relevant stakeholders in augmenting the income and generating employment in rural areas. ICAR-CIPHET has so far filed 71 patents out of which 26 have been granted. The institute also has Food Testing Laboratory, Agri-Business Incubation Centre, and Post-Harvest Machinery and Equipment Testing Centre.

All India Co-ordinated Research Projects (AICRP) on Post-Harvest Engineering and Technology (PHET)

The All India Coordinated Research Project on Post-Harvest Engineering and Technology was launched by the Indian Council of Agricultural Research in September 1972. The Project is currently operating at 31 centres covering almost all the states and agro-climatic zones of the country. The aim is to develop location and crop specific post-harvest technologies and equipment to minimize quantitative and qualitative post-harvest losses and to produce value added products from agricultural crops including livestock and their by-products. The major activities are:

(i) Adoption/development of equipment/technologies for reduction in post-harvest losses during critical post-harvest stages/operations

(ii) Development of need based agro-processing centres (APCs) in different production catchments for income augmentation and employment generation

(iii) Value added products from agricultural crops/commodities

(iv) Prototype development and process refinement with a view to develop complete packages for post-harvest utilization of crops/commodities and their by-products

(v) Multilocation trials and demonstrations of the post-harvest technologies

All India Co-ordinated Research Projects (AICRP) on Plastic Engineering in Agriculture Structures & Environment Management (PEASEM)

AICRP on Plastic Engineering in Agriculture Structures & Environment Management (PEASEM) became operational in the year 1988 by the name of AICRP on Application of Plastics in Agriculture (APA). The project is operative at 14 centers including six ICAR Institutes, seven SAUs and one CAU. The project has contributed in the development and modification of plasticulture technology in the area of water harvesting and management, surface cover cultivation, irrigation systems, plastic mulching, animal shelters, aquaculture technology and use of plastics in farm tools, machinery, post-harvest handling and packaging processes. The project has very good impact on farmers field particularly due to enhanced income per unit area of land and substantial saving of inputs like water, fertilizer and manpower.

Consortia Research Platform for Secondary Agriculture (CRP on SA)

The Consortia Research Platform Project on Secondary Agriculture started in a project mode in 2015 with limited budget released in October 2015. The project is currently operating with its 5 centres in other states. The project aimed to utilize the whole biomass generated from agricultural production for processing and value addition with objectives of maximizing the income generation and minimizing wastage for achieving better quality of life and cleaner environment. The scheme has developed and established pilot plants for makhana, developed and licensed numerous value-added products and also established APC units.

Infrastructure

Workshop

ICAR-CIPHET, Ludhiana and Abohar campus have separate workshop facilities which are used to manage fabrication and modification of post-harvest machineries, designed, and developed under different research projects. The workshops also extend service support to repair and maintenance of institute facilities/ work etc. from time to time. Workshops have machines/ equipment such as lathe machines, drilling machines, gas welding set, arc welding set, sheet bending machine etc. to deliver their services. Besides this, various measuring instruments are also available in the workshops, which are useful in day-to-day research work.

Library

ICAR- CIPHET library plays an important role and act as a centre for knowledge and information related to the Institute's mandate. It has a good collection of books and journals in post-harvest engineering, food processing, engineering, microbiology, biochemistry, biotechnology etc. During the reported year, the total number of books and standards in the library are 5315. The library as a member of consortium for e-Resources in Agriculture (CeRA) is getting access to online full text journals and e-books. In addition of these, several national and international serial, publications, annual reports, newsletters and

research bulletins have been received on gratis and are available to the readers.

Guest House

Both Ludhiana and Abohar campus have guesthouse facilities for providing accommodation to ICAR/SAUs/Government employees and farmers. One International Training Centre with 08 AC-rooms and dining hall with kitchen is also available at Ludhiana campus.

Agro Processing Centre (APC)

Agro-processing centre is generally used to process the agricultural produce in production catchment with a view to enhance employment and income opportunities in rural areas. At ICAR-CIPHET, modest agro-processing centre has been established for processing of bengal gram, green gram, pigeon pea, maize, black pepper, turmeric, coriander etc. The processed products are being regularly sold to customers in and around ICAR-CIPHET. Besides, the APC facilities are also used to impart training to potential small rural entrepreneurs.

Staff Position

ICAR-CIPHET

Category	Sanctioned Strength	Filled		Total Filled	Vacant
		Ludhiana	Abohar		
Director (RMP Post)	01	01		01	00
Scientific	77	32	02	34	43
Administrative	42	17	02	19	23
Technical	29	19	06	25	04
Supporting	03	01	01	02	01
Total (Institute)	**152**	**70**	**11**	**81**	**71**

KVK, Fazilka, Abohar

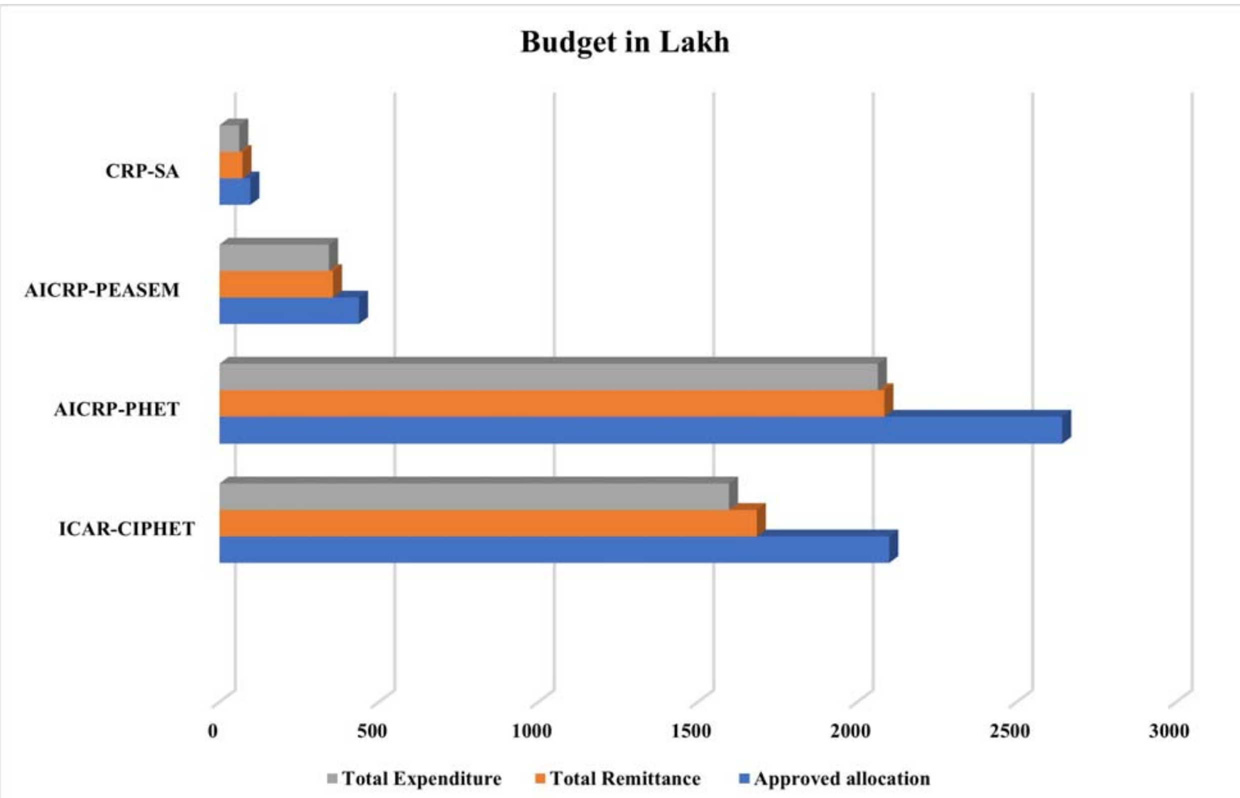
Category	Sanctioned Strength	Filled	Vacant
Programme Cordinator/ Senior Scientist & Head	01	—	01
Subject Matter Specialist/T-6*	06	01	05
Farm Manager/T-4	01	—	01
Program Assistant (Computer)/ T-4	01	—	01
Program Assistant (Lab. Tech.)/ T-4	01	—	01
Assistant	01	—	01
Stenographer Grade-III	01	—	01
Driver	02	—	02

Budget (Rs. in lakhs)

Plan BE/RE (2022-23)

(As on December 31, 2022)

Scheme	Approved allocation	Total Remittance	Total Expenditure	% Utilization with respect to remittance
ICAR-CIPHET	2099.79	1684.55	1597.48	94.83
AICRP-PHET	2642.24	2084.50	2064.24	99.03
AICRP-PEASEM	437.45	355.85	343.27	96.46
CRP-SA	96.55	72.10	61.80	85.71



Revenue Generation

Scheme	Financial Year	Revenue Generated
ICAR-CIPHET	2022-23	23.17

Note: The Financial Year is from April to March (2022-2023)

Research Highlights

1.1. Machines/Equipment Developed

1.1.1. *Photoreactor for ethylene degradation*

Substantial quantity of fruits and vegetables is wasted due to undesirable ethylene exposure. A photoreactor for ethylene degradation has been developed to meet the challenge of ethylene management in the supply chain. The photoreactor is novel in terms of photoreactor design, TiO_2 coating, and application of both photocatalytic and photochemical oxidation techniques in ethylene management for perishables. The photocatalytic and photochemical oxidation techniques comprise the use of ultraviolet (UV) radiation with or without a catalyst. In photocatalytic oxidation a catalyst primarily a semiconductor such as TiO_2, is essential which acts as a photocatalyst on irradiation with UV light (254 nm) and thus facilitates the oxidation of ethylene at its surface.

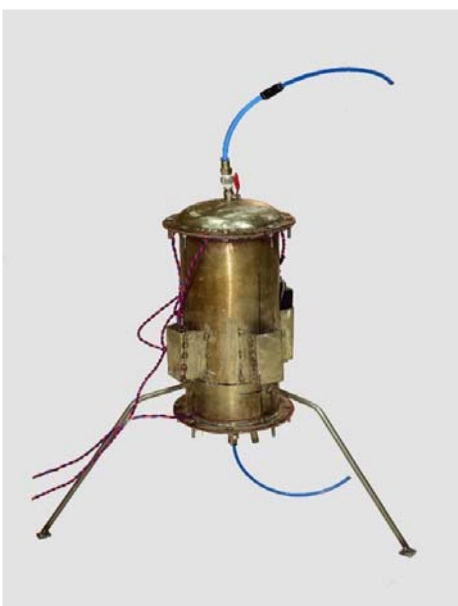


Fig.1. Photoreactor for ethylene degradation

The feasibility of UV-C degradation of methylene blue (MB) was checked and found in the photocatalytic (UV-C + TiO_2) process was significantly higher than photolysis (UV-C) in a reactor. The degradation rate of MB increased with treatment (contact) time and TiO_2 loading content in the samples. The ethylene degradation ranged between 6.7 to 48% with varying concentrations of ethylene (nearly up to 200 ppm initial concentration of ethylene, degradation in 15-20 seconds). The installation of the photoreactor(s) in the storage facility will enhance the shelf life of bananas by 1.5-2 folds. The photoreactor for ethylene degradation is given in Fig.1.

1.1.2. *IoT-based real-time monitoring system for cold storage*

The study aimed to design and evaluate an IoT-based modular system to remotely monitor the microclimate parameters, i.e., temperature, relative humidity, O_2, and CO_2 of cold storage room. The designed and developed IoT-based monitoring system has been installed in the onion cold storage and the real-time values of parameters are displayed in the web dashboard of the IoT platform (Fig.2). The designed modular IoT system precisely monitors microclimate parameters. The modular system consists of microcontroller based on ATmega2560 with three sensors *viz.*, DHT22 (temperature & humidity), SEN0322 (oxygen), and MH-Z19C NDIR (carbon dioxide), respectively. The modular system is connected to Wi-Fi through ESP8266-01 module and to Thing Speak using API key. This system represents a complete monitoring system for recording and displaying the parameters inside cold storage.

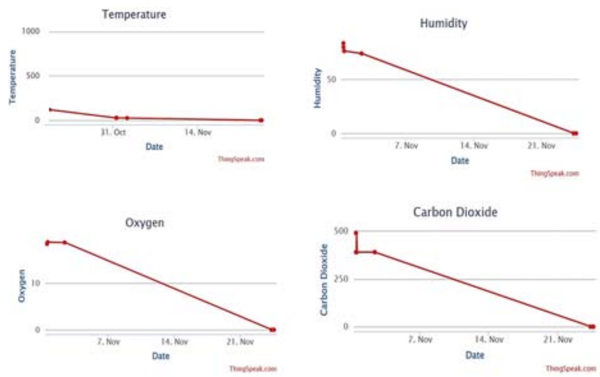


Fig. 2. Real-time values of monitoring parameter in IoT web dashboard

1.1.3. *Buckwheat dehuller*

Buckwheat (*Fagopyrum esculentum* Moench), commonly known as *Kuttu* is a nutritious gluten-free grain with 25% hulls that require to remove before consumption. In India, there is no effective machine available for dehulling of this grain. Currently, buckwheat flour is marketed with blackish hull particles while consumers demand the hull free flour for good quality food products. Therefore, ICAR-CIPHET has developed a 40 kg/h capacity machine for dehulling of buckwheat that can be operated by a single trained staff (Fig.3b.). The dehulling unit of the machine comprises a 40 mm×380 mm horizontally mounted stationary stone and an equal-sized flexible rotating bottom stone. Three phase electric motor (2 hp) drives the bottom stone. The top stone is secured by four cap screws, allowing for easy parallel adjustment. A round plate (the bottom stone) perpendicular to the driving shaft attaches to the top. The dimension of the machine is 1.50 m×1.20 m×1.50 m. The buckwheat seed is fed from a hopper, through the center of the top stone. The dehulled buckwheat grain then goes to the grading unit of this machine comprising of two round screen sieves of the diameter of 4 mm upper side and 3 mm diameter on the lower sides for effective separation of dehulled buckwheat grains. Unhulled and dehulled grains are collected in separate channels. These grading sieves are operated with a 1 hp single-phase motor. The total power consumption of this machine is 1.25 kWh.The machine has 67% dehulling efficiency at low seed moisture (≤6% wb) in a single pass with less than 6% broken. The approximate cost of machine is Rs. 40,000.

1.1.4. *Popped makhana grading machine*

A simple and compact grading machine has been developed for grading of popped makhana in different sizes (12-15 mm, 15-19 mm and >19 mm diameters) and to separate flattened makhana. The grader consists of 3 concentric perforated cylinders of 1000 mm length made from SS304. A conical feeding trough is placed with the inner cylinder. All the cylinders are joined together to operate at same speed. The inner cylinder is mounted on a hollow shaft, which is rotated by belt pulley arrangement. The cylinder assembly is controlled through VFD drive. Outlets for each grade of popped makhana are placed to collect the graded makhana. The grader separates flattened and unpopped

Fig. 3a. Whole buckwheat

Fig. 3b. Buckwheat dehuller

Fig. 3c. Dehulled buckwheat

makhana near the feeding end. This machine is operated by 1 hp electric motor and 2 unskilled persons are required to operate the machine. Capacity of the machine is 200 kg popped makhana per hour. Tentative cost of the machine is Rs. 1.5 lakh.

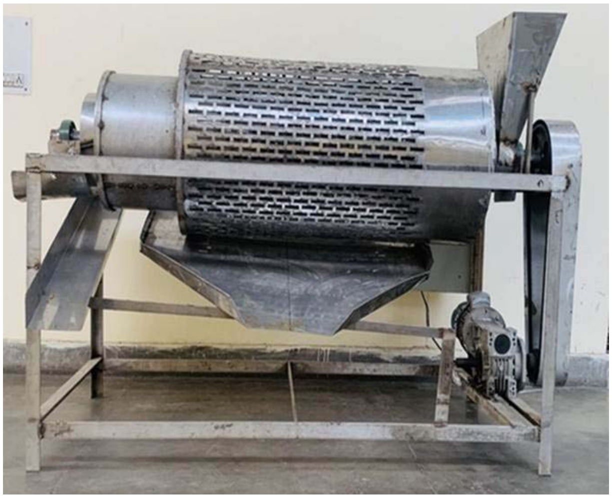


Fig. 4. Popped makhana grading machine

1.1.5. *A prototype of table-top vacuum frying system*

Vacuum frying is an alternative frying technology to address the limitations of conventional frying such as formation of undesirable components like acrylamide, high fat absorption, undesirable browning in fruits and vegetables products, reduced stability of used oil and loss of nutrients. A table-top vacuum frying system has been developed at ICAR-CIPHET (Fig.5.). The prototype consists of a stainless-steel vessel of 10 litres capacity with internal diameter of 330 mm and a height of 165 mm. The lid of the vessel is fitted with the lifting mechanism which is attached to the frying basket. The basket is of stainless steel with a diameter 155 mm and height 65 mm and perforations of 6 mm. The basket when submerged in the frying medium (oil) reach 152 mm deep from the top of the lid and when lifted it reaches a height of 106 mm from the top of the lid. The total lift/dip is 46 mm. The vacuum is created with the help of an oil-free diaphragm-type vacuum pump. The oil-free diaphragm-type vacuum pump has dimensions of 260 ×320×230 mm for length, width, and height. The lid is also attached with a temperature sensor (PT 100) and vacuum gauge for monitoring the temperature and vacuum, respectively. The water-recirculating type glass condenser separates the condensates arising from the frying chamber and prevents entering the vacuum pump. The condenser unit with the collector has a total height of 610 mm with a 250 mm height of the actual condenser and a diameter of 45 mm. The minimum oil requirement of the system is 3 litres to fry the product. The quantity of the product to be fried will depend on the dimensions and density of the respective products. The performance of the system has been evaluated by frying potato fries under following experimental conditions: constant vacuum level (7.99 kPa), temperature (100, 120, and 140°C), and time (5, 7.5, and 10 minutes). For experiments, 200 g of sample was used for frying. The process consists of a selection of uniform-sized potatoes, washing, peeling, and cutting to a size of 7 mm thickness followed by dipping in 2% citric acid solution to prevent browning. The water is then drained, the sample is then kept in the freezer for 30 minutes. The product is then retained in the frying basket while achieving desired temperature & vacuum. After achieving the desired vacuum level and temperature, the basket is immersed in the frying medium for the required duration. Then, the basket is lifted, and vacuum is released, and

Fig. 5. Vacuum frying prototype

Fig. 6. Potato fries vacuum fried at (a) 100 °C (b) 120 °C (c) 140 °C (d) under atmospheric conditions at 160 °C

the product is taken out of the vessel. The effect of vacuum frying parameters on moisture loss, fat absorption, color index, texture, and free fatty acids have been evaluated. Fresh oil has been used for every experiment to maintain the constant characteristics of the frying medium. The color change has been positively correlated to the vacuum frying temperature and duration of frying. The L, a and b values were 40.39, 10.95, 31.83 and 54.85, -1.81, 30.95 for conventional and optimized vacuum fried samples, respectively. Textural analysis of vacuum-fried potato fries indicated an increase in hardness, cohesiveness, gumminess, and chewiness while a decrease in the adhesiveness has been observed with increasing time and temperature of vacuum frying. The hardness, chewiness and gumminess have been recorded as 109.62 N, 6.39, 140.81, and 175.38 N, 132.06, 1427.43 for conventional and optimized vacuum fried samples, respectively. A high value of fracturability has been observed at high temperature and time of vacuum frying due to loss of moisture and increase in crispness. Based on the quality parameters (moisture loss, fat absorption, colour index, texture, and free fatty acids), the optimized conditions for vacuum fried potato fries have been reported as vacuum level 7.99 kPa, temperature 120°C, and 7.5 minutes. Vacuum fried fries exhibited reduced fat absorption, improved color and texture in comparison to conventionally fried potato fries (160 °C for 6 minutes). The developed system can suitably be used for frying of fruits and vegetables products while maintaining the colour and texture.

1.1.6. *Handheld NIR instrument*

Near infrared (NIR) spectroscopy has been used by the food processing industry for product quality evaluation. Now a days, consumers have become more aware about knowing the quality of the product they purchase. Therefore, there is dire need for user-friendly technologies which are non-destructive, capable of routine product inspection, and can be used by the end-users. The development and advances in sensing technologies have led to miniaturization of near infrared (NIR) spectrophotometers in the form of portable handheld equipment which can be used for quality control purposes. Considering above points in view, we at ICAR-CIPHET have developed near infrared (NIR) spectroscopy-based models using laboratory NIRS for quality assessment of besan with respect to its adulterants such as metanil yellow dye, maize, pea, and khesari flour and then got fabrication of handheld NIR instrument, through outsourcing (Fig.7). Calibration methods for quantitative detection of adulterants *viz*. metanil yellow, khesari, pea and maize flour in *besan* have been developed and are being validated. Support vector machine classification model is also developed to classify pure *besan* from adulterated samples. Further refinement of handheld NIR instrument is under progress.

Fig. 7. Handheld NIR instrument

1.1.7. *Quality evaluation of onions stored in the CIPHETs onion storage structure*

The storage losses in onions in tropical are very high. There is a need to develop on farm cost-effective technologies for onion storage. Most existing on-farm storage structures lack control over environmental factors to achieve an optimal storage environment and improved structures are required as per Indian climatic conditions. Therefore, in the present study, a low-cost air modification unit has been developed to integrate it with the on-farm onion storage structure. The developed air modification unit was evaluated with load of onions in a storage structure for self-life, losses, and changes in the biochemical parameters. Evaluated the structure for 120 days and data was recorded at the interval of 10 days. Physiological loss of weight was observed higher (16%) in ambient conditions than in the onion storage structure (11%) after 120 days of storage. Total phenolic content (TPC) and total flavonoid content (TFC) are found to be higher in onion storage structure than ambient conditions and showing time-dependent decrease under both ambient and onion storage structure conditions. The spoilage loss observed in ambient conditions is 15.5% and in onion storage structure is 11.6 %. Germination loss is 6.8 % and 3.5 % in ambient conditions and onion storage structure respectively. Total loss (PLW, spoilage, germination loss) is about 38.7 % and 26.3% in ambient conditions and onion storage structure respectively. The farmers using the air modification unit on the farm can reduce 10-12 % losses of onions by spoilage, germination, and weight loss and can maintain the quality of onions for a longer period.

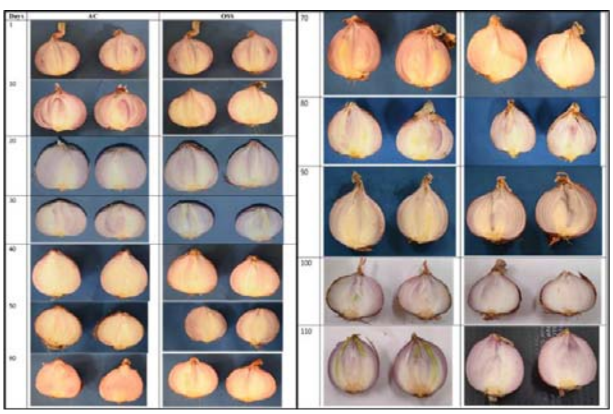


Fig. 8. The physical appearance of onions stored for 120 days at the interval of 10 days (AC- Ambient Condition, OSS- Onion Storage Structure)

1.2. Processes/Models

1.2.1. *Optimised solid-state fermentation (SSF) conditions by One-Factor-at-a-Time (OFAT) approach for laccase enzyme production from de-oiled rice bran*

DORB (de-oiled rice bran) is produced in large amounts by rice bran oil industries and is presently underutilized. The compositional analysis of DORB includes cellulose (18.45%), hemicellulose (17.94%) and lignin (15.84%) which has been found to be beneficial for growth of *Trametes* sps. This fungus produces extracellular Laccase enzyme to degrade the lignin in DORB. This will serve both purposes of crude enzyme production and simultaneous biomass degradation. So, OFAT approach has been utilized for optimization of physiological parameters for SSF. The sequential order of OFAT experimental variable and fixed factors,

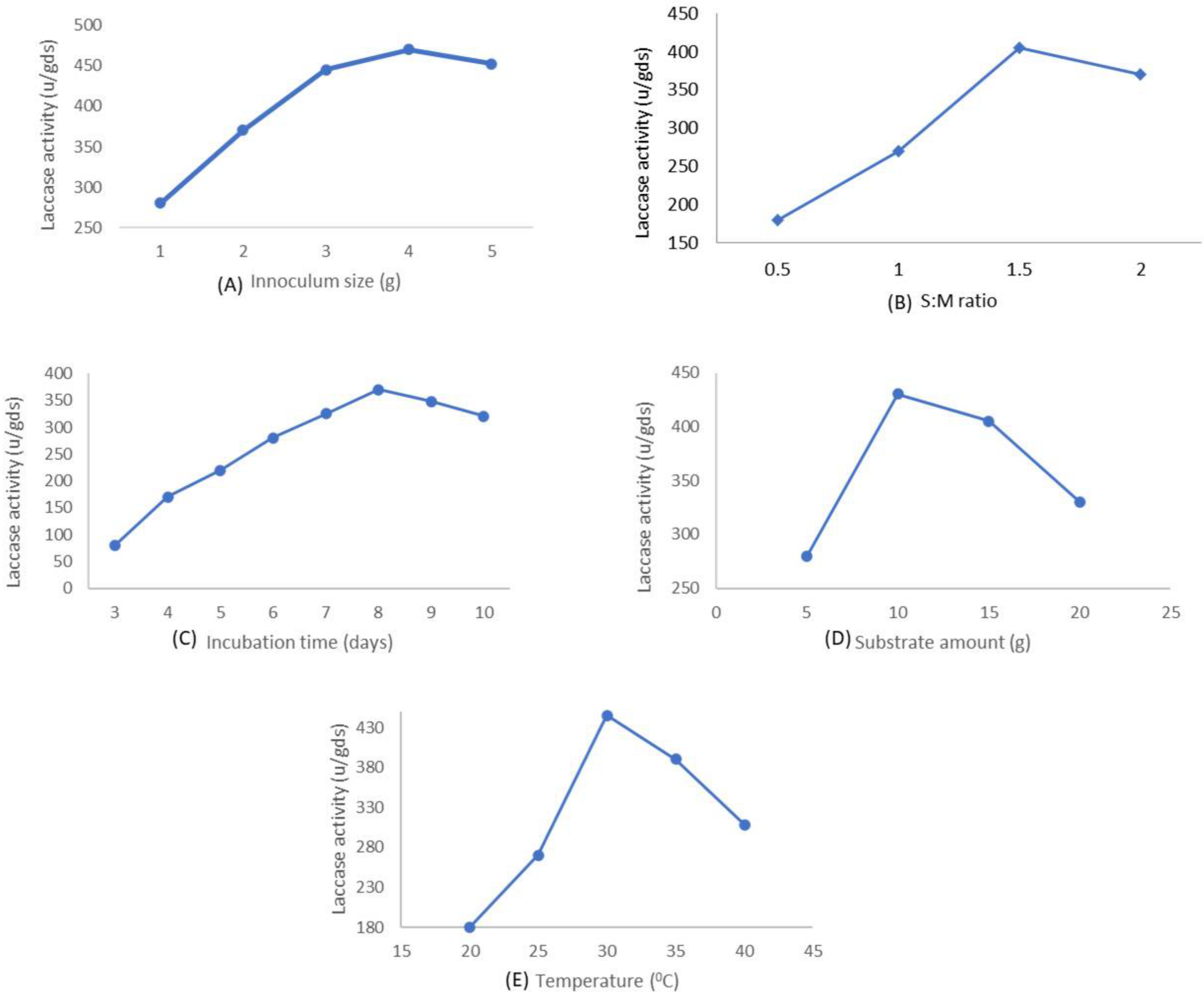


Fig.9. Laccase enzyme activity under OFAT conditions: (A) Inoculum size, (B) S:M ratio, (C) Incubation time, (D) Substrate amount, (E) Temperature

levels of variable factors, growth conditions provided during OFAT experiment and harvesting of samples for enzyme assay are incubation time (3-10 days), substrate amount (5-20g), incubation temperature (20-40°C), substrate to moisture (S:M) ratio (l:0.5- 1:2.5) and inoculum size (1- 5 disc). The harvesting of crude extract was done on the day that showed maximum laccase enzyme activity. Optimized conditions for maximum laccase enzyme production for OFAT experiments are incubation time (8 days), substrate amount (10g), incubation temperature (30°C), S:M ratio (1:1.5) and inoculum size (4 disc). Results are presented in fig.9.

1.2.2. *Bioactive compounds in mango seed kernel extract*

Mango seed kernel, a by-product of the processing industry, can be valorized as a potential source of bioactive compounds, including phenolics and flavonoids. However, very little information about the individual compound is available in the literature; therefore, an HPLC-based method has been developed for separating major phenolic and flavonoid compounds from mango seed kernels. The ethanolic extract of mango seed kernel obtained from the optimized process was subjected to Agilent Liquid Chromatograph 1260 Infinity

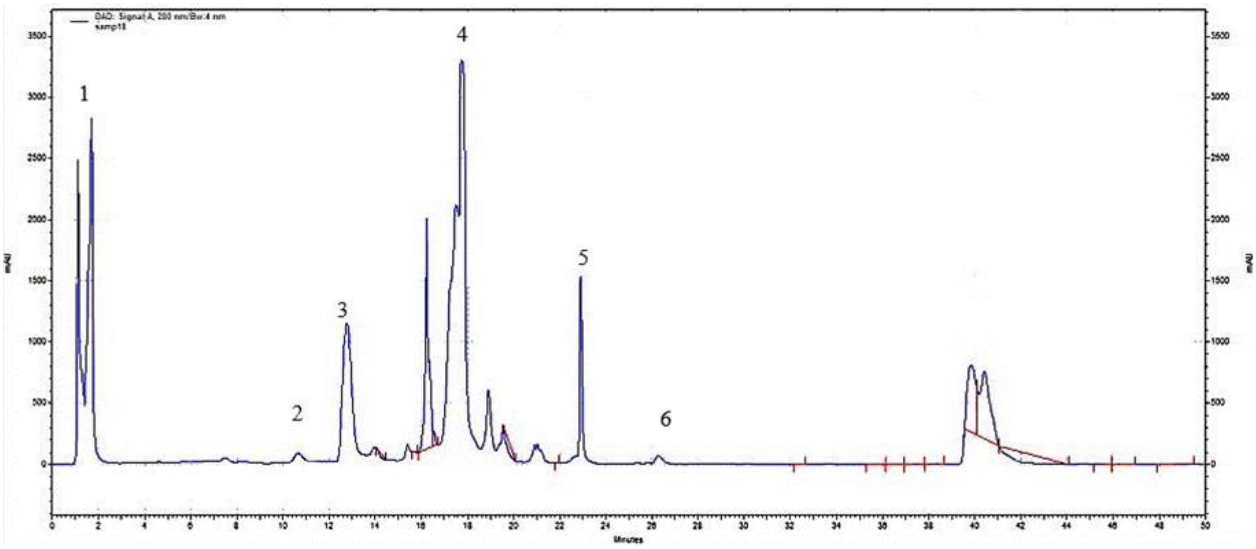


Fig.10 a. HPLC chromatogram of mango seed kernel extract (1: Gallic acid; 2: Mangiferin; 3: Rutin; 4: Ferulic acid; 5: Cinnamic acid; 6: Quercetin)

equipped with pumping system (1260 Quat Pump VL), autosampler (1260 ALS), reversed phase ZORBAX Eclipse Plus C18 column (100 mm × 4.6 mm, 3.5 µm, Agilent, USA) and diode array detector (1260 DAD VL). The standard namely gallic acid, mangiferin, rutin, ferulic, cinnamic acid, and quercetin were analyzed under the same conditions. The analysis time for elution of gallic acid, mangiferin, rutin, cinnamic acid, and quercetin were 1.7, 10.66, 12.77, 17.75, 22.91 and 26.27 min, respectively (Fig.10a). As the method does not need any pre-treatment, hence this can be directly utilized for routine screening of various plant extracts along with the quantitative determination of phenolics and flavonoid compounds. The quantitative analysis showed that the mango seed kernel possesses gallic acid, mangiferin, rutin, ferulic, cinnamic acid, and quercetin in the concentration of 137.80, 33.46, 453.95, 103.74, 14.87 and 4.21 mg/100g, respectively.

The mango seed extract has been evaluated for its antimicrobial activity against pathogenic *Staphylococcus aureus* MTCC 439 and *Escherichia coli* MTCC 96 cultures obtained from Institute of Microbial Technology: Chandigarh by agar well diffusion method. The mango seed kernel extract of different concentrations (50 mg/ml to 500 mg/ml) were subjected into the well. The phenolic compounds present in the extract, diffuses in the agar plates, and inhibits the growth of pathogenic species. After 48 h of incubation, the diameter of the zone of inhibition was measured in cm. The maximum zone of inhibition was obtained with a concentration of 500 mg/ml in both tested species whereas no zone was found in the control (Fig.10b). Furthermore, the mango seed kernel extracts at lower concentration (50 mg/ml) showed more effect against *S. aureus* than *E. coli,* but at higher concentration (500 mg/ml) of extract showed more antibacterial activity against *E. coli*.

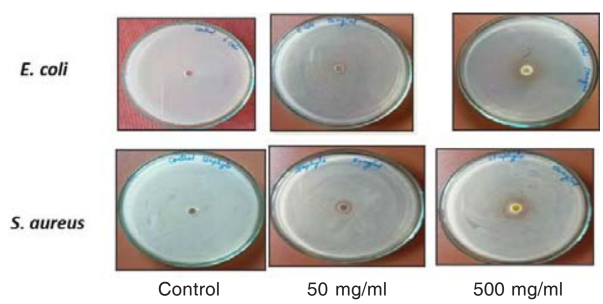


Fig. 10b. Antibacterial activity of mango seed kernel extract

1.2.3. *Process for vinegar production using syrup waste from osmotic dehydration of mango*

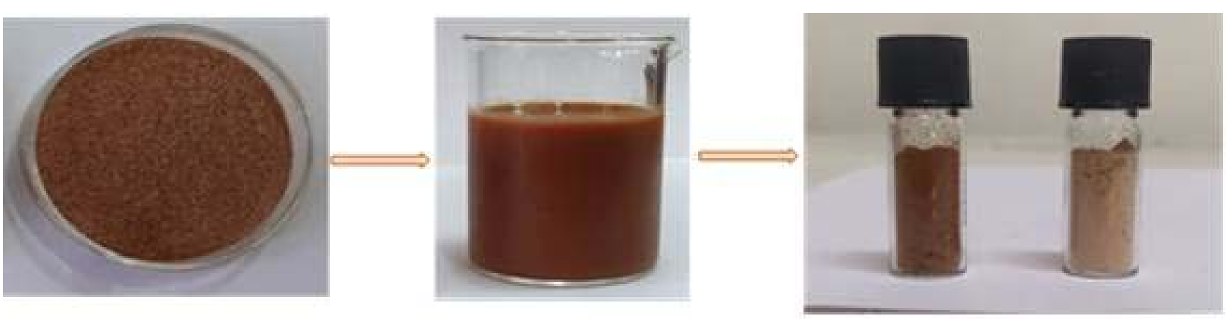
Various fruits are consumed as fresh or in the form of processed products like jam, jelly,

Fig. 11. Alcoholic fermentation of syrup from osmotic dehydration of mango after 5 days

pickles, candy etc. To increase the shelf life of fruits and vegetables different methods are being employed. Among various methods osmotic dehydration is one of the best and suitable method to increase the shelf life of various fruits and it also helps to retain vitamins and minerals, color, flavour and taste of the product. However, during osmotic dehydration of fruits, large amount of waste generation in the form of sugar syrup takes place. This huge quantity of sugar syrup is not finding any commercial usage and is resulting in burden on the environment. The present study reports process to produce vinegar using the syrup waste from osmotic dehydration of mango. The process involves two steps- In first step alcoholic fermentation is carried out using yeast and in the second step acetic acid fermentation by acetic acid bacterium. The syrup waste from osmotic dehydration of mango is diluted to bring down the total soluble solids (TSS) to 18 °Brix. Fermentation of pasteurized syrup waste from osmotic dehydration of mango by commercial yeast at one percent inoculum at temperature of 30 °C resulted in 9.5% alcohol after 5 days of incubation (Fig.11). In second step acetic acid fermentation by using locally isolated acetic acid bacterium form rotten kinnow fruit at 10% inoculum resulted in production of vinegar with 5.8% acetic acid after 23 days of incubation. From one litre of syrup waste obtained from osmotic-dehydration of mango, about 2.5 litres of vinegar is produced.

1.2.4. *Microencapsulation of pigeon pea husk phenolic compounds using spray drying*

In India, pigeon pea (*Cajanus cajan*) is mainly consumed in the form of dehusked split pulse as '*dhal*' obtained by milling of this pulse. The milling of pigeon pea annually produces a substantial quantity of by-products in form of husk, chuni and brokens. The pigeon pea husk, a valuable by-product of pulse milling industry, is potentially rich in health-promoting bioactive compounds such as phenolic compounds. The phenolic extract of pigeon pea (cv. PAU 881) husk has been obtained under the optimized



Pigeon pea husk | Husk phenolic extract | Phenolic powder | Microencapsulate phenolic powder

Fig.12. Pigeon pea husk powder

conditions of 41.80% aqueous ethanol concentration, 59°C extraction temperature and 6h extraction time. It has been microencapsulated using maltodextrin and maltodextrin with gum arabic (3:1) as coating agent with the spray drying technique. The core to coating agent ratio varied from 1:2 to 1:6. The spray drying of all samples has been performed at inlet air temperature of 140°C, air flow rate 2400 rpm, feed flow rate 10 rpm and atomization pressure of 2 bar. The spray dried samples have been analyzed for encapsulation efficiency and colour attributes. The sample, micro encapsulated with maltodextrin and gum arabic in a core to coating agent ratio of 1:4 showed the highest encapsulation efficiency and gave L*, a*, b* value of 76.51, 10.53 and 20.60, respectively.

1.2.5. *Near infrared spectroscopy-based calibration model for detection of metanil yellow up to 0.1% in besan*

In our earlier studies, Fourier transform infrared (FT-IR) based model for detection of metanil yellow in *besan* has been developed. However, the limit of detection of metanil yellow in *besan* was one per cent. To improve the model for detection of lower amounts of adulterant, near infrared spectroscopy-based calibration model for detection of metanil yellow (0.05% to 8.0%) in *besan* flour has been developed. Standard normal variate, detrend and 1st derivative pre-treatments have been used to pre-process the NIR spectral data. MPLS, PLS and PC regression analysis was carried out and statistical parameters *viz*. R^2, SEC, SECV and I-VR values have been evaluated for all the developed models (MPLS, PLS and PC). Comparative analysis of all the models revealed that MPLSR model showed R^2 as 1.0 with SEC of 0.045, SECV of 0.169. Cross validation resulted in R^2 as 1.0 and SEP of 0.183. The method can detect 0.1% of metanil yellow adulteration in *besan*.

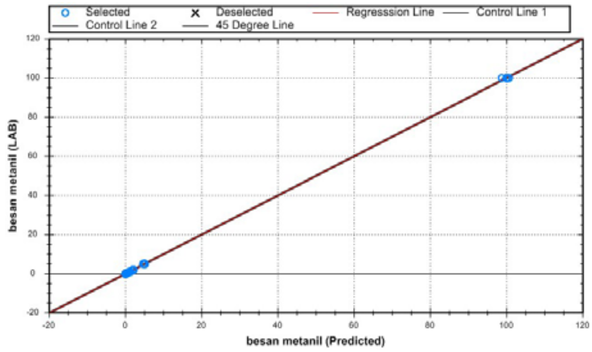


Fig. 13. Cross validation prediction model for quantification of metanil yellow in *besan*

1.2.6. *Optimised cryogenic grinding process for ashwagandha roots*

Grinding medicinal plants at ambient temperature generates heat that results in the loss of heat-labile bioactive components. Ashwagandha (*Withania somnifera* L.) roots have been used in the traditional Indian medicine system since ancient times for the treatment of many human ailments. To maximize the retention of its bioactive components during the grinding of Ashwagandha roots, the cryogenic grinding conditions of the lab model cryogenic grinder have been optimized following three independent variables, *viz.,* grinding temperature (-120 to -30 °C), grinder speed (2000-14000 rpm), and moisture content (6-12% w.b.) using response surface methodology (RSM). The particle size of ashwagandha powder (Fig. 14), obtained using optimized and validated cryogenic grinding conditions was 0.321mm (as compared to 0.623 mm at ambient grinding), with 93.99 mg/100g essential oil, 798.99 mg (GAE equivalent/100g) total phenols, the specific energy consumption of 1.496 kWh/kg and color difference as 1.54. The total cost of cryogenic grinding of ashwagandha roots was about Rs. 900. Based on assumed selling prices for ashwagandha roots powder as Rs. 1800 per kg, the cost-benefit ratio of cryogenically ground ashwagandha roots powder was 0.70.

Fig. 14. Whole and ground powder of Ashwagandha (a: cryogenic b: ambient)

1.2.7. *Optimised cryogenic grinding process for safed musli roots*

Safed Musli (*Chlorophytum borivilinum*) roots have been used in the traditional Indian medicine system since ancient times for the treatment of many human ailments. It is a hard-to-grind material, so to minimize the particle size and specific energy consumption and maximize the bioactive contents of the safed musli roots, the cryogenic grinding conditions of lab model cryogenic grinder were optimized following three independent variables, *viz.*, grinding temperature (-120 to -10 °C), grinder speed (2000-14000 rpm), and moisture content (6-12% w.b.) using response surface methodology (RSM). The numerical optimization indicated that 8.79% moisture content, 88 °C of grinding temperature and 8283 rpm grinder speed is optimum for cryogenic grinding of safed musli roots with 0.87desirability. The particle size of safed musli powder (Fig. 15a) obtained using optimized and validated cryogenic grinding conditions was 0.30 mm (as compared to 0.623mm at ambient grinding), with 369.82 mg/100g saponin content, 177.51 mg (GAE equivalent/100g) total phenols, the specific energy consumption of 1.87 kWh/kg and colour difference as 1.267. Based on assumed selling prices for safed musli roots powder as Rs. 3800 per kg, the cost-benefit ratio of cryogenically ground safed musli roots powder was 0.69. Fig. 15b represents comparison of various characteristics of cryogenically and ambiently ground powder of safed musli.

Fig. 15a. Cryogenically and ambiently ground powder of safed musli roots (a: cryogenic b: ambient)

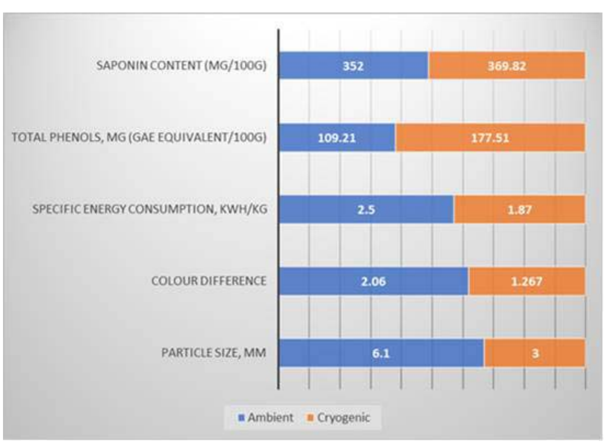


Fig. 15b. Comparison of cryogenically and ambiently ground powder of safed musli

1.2.8. *Effect of immature dried kinnow fruit (IDKF) crude bioactive extract on expression and secretion of anti-oxidative enzyme and cytokines*

Antioxidant enzymes are the natural defense system of the body against reactive oxygen and nitrogen species and include superoxide

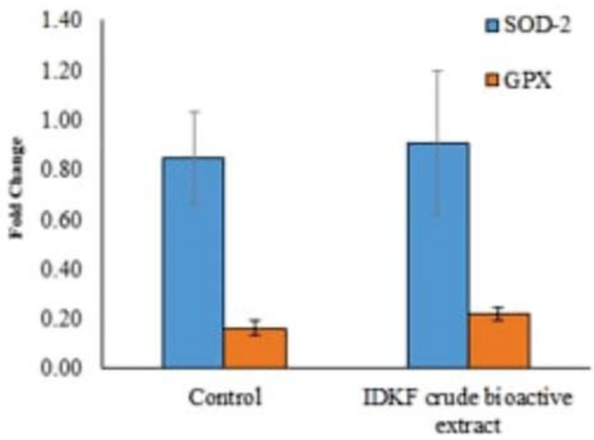


Fig. 16a. Effect of IDKF crude bioactive extract and quercetin (standard) on fold expression of anti-oxidative gene (Superoxide dismutase-SOS

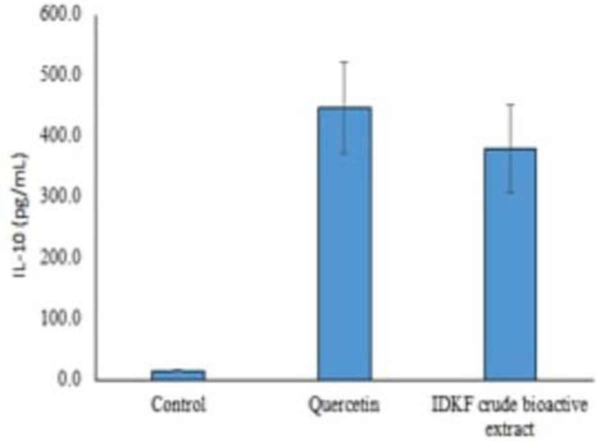


Fig. 16b. Glutathione peroxidase-GPX) and anti-inflammatory cytokines secretion (IL-10 pg/mL) in HT-29 Cells

dismutase, catalase and glutathione peroxidase etc. Superoxide dismutase is recognized as the primary defense barrier against reactive oxygen species (ROS), which catalyzes the dismutation of superoxide anion radicals O_2. to hydrogen peroxide (H_2O_2). Hydrogen peroxide, generated by the activity of SOD is eliminated by its conversion to H_2O in subsequent reactions by GPx and catalase. In the present investigation, anti-oxidative potential of crude bioactive extract of IDKF have been studied at gene (transcription of target genes SOD and GPx) and protein (secretion of target anti-inflammatory and inflammatory cytokines: IL-10 and TNF-á) in HT-29 cells challenged with crude bioactive extract of IDKF and quercetin. Both quercetin (50 mg/mL) and crude bioactive extract of IDKF (50 mg/mL) under similar conditions induced the expression of SOD by 0.8 and 0.9-fold, respectively in comparison to untreated control cells. However, GPx was marginally upregulated by around 0.1 and 0.2-fold respectively for quercetin and crude bioactive extract of IDKF. The upregulated SOD and GPx expression in the present study imply that the crude bioactive extract of IDKF has ability to remove superoxide anions and act as potential anti-oxidative agent. Furthermore, the IDKF extract may also directly scavenge the free radicals since *in vitro* analysis showed its potent DPPH scavenging activity.

The effect of crude bioactive extract of IDKF on secretion of anti-inflammatory (IL-10) and inflammatory (TNF-a) cytokines has been studied by enzyme-linked immuno-sorbent assay (ELISA) (Fig.16a.). The data shows that the crude bioactive extract of IDKF (50 mg/mL) and quercetin (50 mg/mL), both induced secretion of IL-10 in comparison to untreated control cells. However, crude bioactive extract of IDKF had slightly lower effect in secretion of IL-10 compared to quercetin (Fig.16b.), which was found to be statistically non-signiûcant (p>0.05). TNF-a concentration in all the treated sets including control was non-significant and was below the reaction detection range. These preliminary results indicated that crude bioactive extract of IDKF has potential of anti-inflammatory properties that may be useful in delaying of inflammatory and other degenerative diseases.

1.2.9. *Biochemical characterization of black soybean varieties*

Soybeans with different are colors of seed coat *viz.* black, yellow, green, and brown are available in India. Black soybeans (BSB) are rich source of anthocyanins which are present in the epidermis palisade layer of the seed coat. These phytochemicals in black soybean (BSB) have been reported to show health promoting effects. The Indian black seed varieties of soybean have not been characterized for their biochemical profiles. Therefore, in the present study four black varieties of soybean have been characterized for color, proximate composition and fatty acid profile (Table 1) along with one brown and one cream colored variety. L values of cream colored variety VLS-89 was 60.36±0.28, for brown variety 'Rata Bhat' it was 29.78±1.54 and for black varieties value ranged from 13.18 ±0.76 to 18.21±0.76. Proximate composition of seed revealed moisture, ash, protein, fat and total carbohydrate content of different varieties ranged from 11.27-13.01%, 3.97-5.00%, 35.96-41.44, 16.82-21.73% and 26.21-30.23%, respectively. Fatty acid profile showed palmitic, stearic, oleic, linoleic and linolenic acid in the range of 9.25-10.81%, 2.48-3.99, 20.05-36.03, 42.07-58.11, and 6.61-8.74%, respectively. All samples were dehulled to obtain cotyledon and seed coat. The cotyledon, seed coat showed protein content of 38-47.69%, 8.23-10.68%, and carbohydrate content of 16.6-26.47, 73.99-77.67%, respectively.

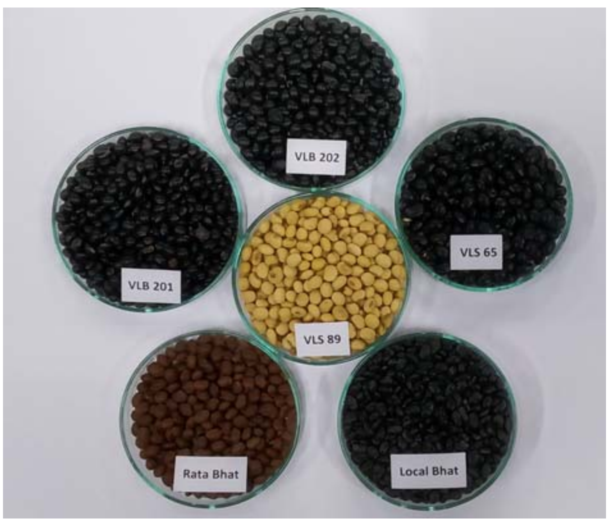


Fig.17. Cream and black varieties of soybean

1.2.10. *Microwave based disinfestation of green gram infested with pulse beetle (Callasobruchus maculatus)*

Pulses constitute an important part of the daily diet of vegetarian population as a major source of protein. It is reported that pulse bruchids (main storage pests) cause the major damage to the pulses during storage. Currently, fumigation is the most prevalent option to manage the insects in grains. However, there are several other physical measures, which have been reported to be used as an alternative to fumigation like dielectric heating using microwaves and radio frequency. A study has been carried out to observe the effect of microwave radiations against bruchids (*Callosobruchus maculatus*), infesting green gram. The source of microwave used in the study is a convection type domestic microwave oven (IFB 30SC®) with rotating table having 30 l capacity and MW Power output of 900-watt (consumption microwave – 1400-Watt, operation frequency – 2450 MHz, power level as 10 from 10-100%). Sixty adult bruchids per sample (1 kg each) were artificially infested to green gram and kept for 10-15 days for growth of different stages of bruchids *i.e.*, egg, grub, pupa, and adult. This artificially infested green gram samples (1 kg each) were exposed to microwave (P-HI level) using a microwave glass plate at different exposure periods i.e., 10-50 seconds. Complete adult mortality was observed at an exposure of 25 seconds with green gram layer of 1 cm at P-HI (100%) level at 9.54% moisture content, while it took 50 seconds for 100 per cent mortality of bruchids

Table 1. Fatty acid composition of seed oil in different black genotypes

Fatty acid	VLB-201	VLB-202	VLS-65	VLS-89	Local Bhat	Rata Bhat
Palmitic	9.33±0.04	10.15±0.26	10.94±0.18	11.26±0.35	9.48±0.32	10.35±0.47
Stearic	3.88±0.14	3.33±0.17	2.58±0.14	3.61±0.17	3.25±0.14	3.08±0.09
Oleic	19.94±0.16	27.64±0.54	31.89±0.64	22.17±0.12	34.32±0.48	35.99±0.06
Linoleic	58.7±0.83	52.35±0.54	47.98±0.35	55.21±0.57	45.70±0.57	42.12±0.07
Linolenic	8.16±0.55	6.55±0.09	6.61±0.62	7.76±0.98	7.26±0.09	8.47±0.39

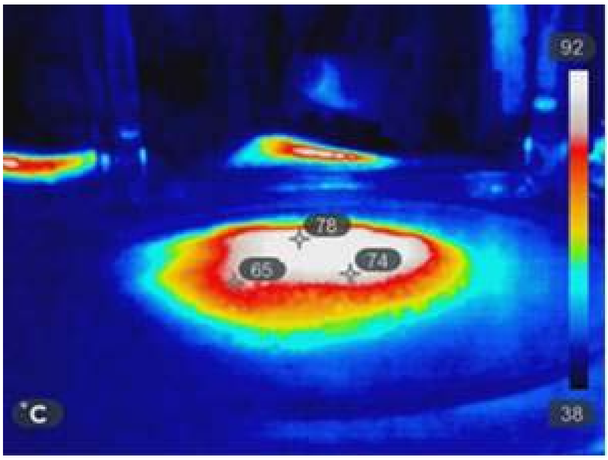


Fig. 18. Thermal image showing temperature build up at 35s and 10mm layer of green gram in microwave oven

as exposed directly without green gram. The sub-lethal exposures (LD_{50}) resulted in deformities like flexed hind leg (58.5±0.20%), curved hind legs (38.5±0.10%) and wing deformation (94.0±0.20%). The grain quality analyses after microwave treatment showed no significant difference in the germination of treated and untreated grains ($p \leq 0.05$). Cooking time was 26.58 min for treated and 26.40 min for untreated green gram. Similarly, no significant difference was observed in water uptake between treated (65.51%) and untreated seeds (65.03%). The study concludes that differential heating during microwave exposure kills the insects without altering the grain quality.

1.2.11. *Low calorie fruit beverages*

Fruit beverage market is continuously expanding and is expected to grow even faster in the coming decade. However, excess intake of high calorie beverages poses several health problems like obesity and diabetes. Therefore, an attempt has been made to optimize process technology for preparing low calorie beverages from aonla and mango fruits to replace sugar with different artificial sweeteners (stevia, saccharin, aspartame and sucralose). These sweeteners were used in different proportion with equi-sweet concentration of 10-12% sucrose and 10% fruit pulp/juice for preparing low calorie fruit beverages. The findings revealed that beverages prepared with 100% artificial sweetener resulted in high production cost while replacement of sucrose with 50% artificial sweetener produced self-stable beverages with identical taste, good ascorbic acid content (30-42mg) and reduced calorie values (20-24 Kcal/100ml) at no extra cost compared to those prepared with sucrose only (49.06 Kcal/100ml). Among different sweetener, beverages containing stevia and saccharin were not liked much by consumers due to their poor after taste. Both aspartame and sucralose presented similar results to sucrose for sweet aftertaste. The optimum amount of sweetener required to produce a sweetness level equal to that of a beverage containing 12% sucrose was found to be 64 mg and 20 mg, respectively for aspartame and sucralose. The developed low calorie fruit beverages can be stored for two months under ambient conditions and six months under low temperature conditions. Although heat processing at 85-90°C for 30 minutes did not cause any noticeable decrease in the sweetness or taste quality of developed low calorie beverages with either sweetener; however, aspartame was less stable during storage. Hence, sucralose can be successfully

Fig. 19. Low calorie fruit beverages

used to replace half of the energy value of commercial mango and aonla beverages without impairing the sensory and biochemical quality of low-calorie fruit beverages.

1.2.12. *Characterization of collagen hydrolysate (CH)*

The conventional chemical extraction methods of collagen hydrolysates (CH) result in lower extraction efficiency with poor quality from animal industry by-products. Hence, an enzyme-assisted process has been developed for improving the yield and quality of collagen hydrolysate and in present study CH from buffalo skin prepared using an enzyme-assisted process has been characterized. The highest yield (27%) of CH was obtained at 30 units of papain and bromelain enzyme treatment for 3 h at 40 °C, as corroborated by assay of free amino acids (6.76 and 15.65 nmol/g skin), degree of hydrolysis, and SDS-PAGE analysis. The molecular weight distribution of collagen hydrolysates ranged from 30 to 65 kDa which is good for their commercial application. The final product has high antioxidant capacity (IC50: α, α-diphenyl-β-picrylhydrazyl DPPH=0.42; HRSA=0.90). The final CH product is found to be safe in terms of cytotoxicity as revealed during the MTT (3-(4, 5-Dimethylthiazol-2-yl)-2, 5-Diphenyltetrazolium bromide) assay for assessing cell metabolic activity. Total expenditure to obtain one kg of CH comes around Rs. 250 and the cost of establishment of batch level processing plant is approximately 15-20 lakh.

Table 2. Proximate composition of Collagen hydrolysate (CH) samples

Proximate analysis (%)	Collagen hydrolysate (CH) samples			
	P20	P30	B30	B50
Moisture	2.66	2.89	2.51	2.63
Fat	0.65	0.74	0.54	0.59
Minerals	2.39	2.56	2.26	2.68
Crude Protein	90.47	89.65	91.2	89.14

P20- Treated with papain 20 units per g, P30- Treated with papain 30 units per g
B20- Treated with bromelain 30 units per g, B50- Treated with bromelain 50 units per g

Table 3. Antioxidant potential: DPPH radical scavenging activity (%) of Collagen hydrolysate (CH) samples

Concentration(mg/ml)	DPPH activity (%)			
	P20	P30	B30	B50
0.2	35.09	32.32	35.59	31.63
0.4	46.56	38.20	46.27	41.22
1	53.82	63.28	59.25	55.27
2	62.46	70.46	65.15	66.96
5	70.27	79.89	74.29	89.24
10	78.23	90.59	82.76	94.51

Table 4. Anti-arthritic property of buffalo collagen hydrolysate (CH)

CH Samples	Concentration (µg/ml)	% Inhibition
B30	10 20 50	50.00±1.13 88.82±2.41 99.47±2.22
B50	10 20 50	80.66±1.86 87.13±2.06 91.42±2.35
P20	10 20 50	69.03±1.69 78.26±1.50 77.12±2.12
P30	10 20 50	61.54±1.08 79.17±2.85 71.07±2.04

1.2.13. *Capacity building of extension professionals for promoting agro processing at field level*

Food processing, post-harvest processing and value addition are nowadays buzz words among different development sectors. A recent study conducted by ICAR-CIPHET revealed lack of awareness about post-harvest technologies among end users at field level. ICAR has established 732 KVKs at grass root level and the easiest way to spread information is to communicate to the extension specialists working at field level. Therefore, the institute has taken initiative to create awareness among Scientist/ Subject Matter Specialists, in post-harvest processing and value addition technologies appropriate to agricultural production catchments to promote agro processing and minimize post-harvest losses. A brainstorming session was organized with experts based on which it was finalized to cover KVKs identified by NCDC for formation of FPOs and centers under Farmer FIRST Programme based on ODOP approach at ATARI Zone basis. Ninety-six (96) KVK's were selected from all Zones of ICAR- ATARI based on these criteria during the first phase. During 2022, two training programmes were organized covering 16 KVKs from six states under ATARI Zone I and II, giving emphasis on different models of agro processing suiting geographical, social, economic needs of different regions. For evaluating the training programmes organized, Kirkpatrick's four-level model framework is adopted.

1.3. Collaborative/ Externally Funded Projects

1.3.1. *Hawaijar making mechanized system*

Hawaijar is a traditional fermented food of North-East India prepared from soybean. The steps involved in traditional method of making *hawaijar* are soaking, boiling and fermenting. The unit operations considered in the mechanized system are soaking, steaming and incubation. The designed capacity of the developed mechanized batch type system is 10 kg. The system consists of a circular structure integrated with different parts to accomplish all the unit operations in a single system. The parameters considered for designing of the system included physical properties of the soybean, increase in volume after soaking and boiling and operating temperature and pressure of the system. Soybean of local variety (JS335) has been selected for the study. The increase in volume after soaking was 2.8 times whereas increase in volume after boiling was 3.25 times than that of fresh seed volume. The volume of the boiled soybean was considered for designing of the working chamber. A *hawaijar* making system has been developed with maximum operating temperature and pressure of 125°C and 2.0 bar respectively (Fig.20). It also includes six trays with nine containers each for fermenting cooked soybeans.

Fig. 20. Mechanized system for *hawaijar*

1.3.2. *Sensor-based system for tracking of banana during transportation*

A sensor-based system for tracking of banana is developed. The sample prototype integrated with temperature and RH sensor, GPS is shown in Fig. 21a. The prototype can be used in tracking and tracing of banana during transportation. This further helps in maintaining shelf life, quality and safety of banana.

A website for tracking the location of transporting vehicle and environmental conditions during Banana transportation, has also been under development (Fig. 21b). On the website, information about farmers, Product traceability (banana harvesting, treatment details etc.), location tracking, sensors data will be made available on the portal. Using the unique code associated with banana lot, each partner of the supply chain as well as consumer can trace the entire history of the product (banana).

1.3.3. *Protocol for machine vision camera-based grading of mango*

A laboratory set-up for grading of mango based on the machine vision camera is under development (Fig. 22 a). This system aims for identification of surface spot and size of mango using machine vision camera. Based on the colour and size, the mango can be graded into four different grades. The system has main three components viz. sensors, interface and connectors and illumination system. In the present study PLC (Programmable Logic Controller) of the vision system has been programmed using Ladder logic program and it provides signal to sensor and camera for image acquisition and analysis. Images are being analysed with software (Delta WPLsoft), so as to identify the surface defects present on mango (Fig. 22 b). The developed system will be beneficial for sorting and grading of mango using surface and size attributes.

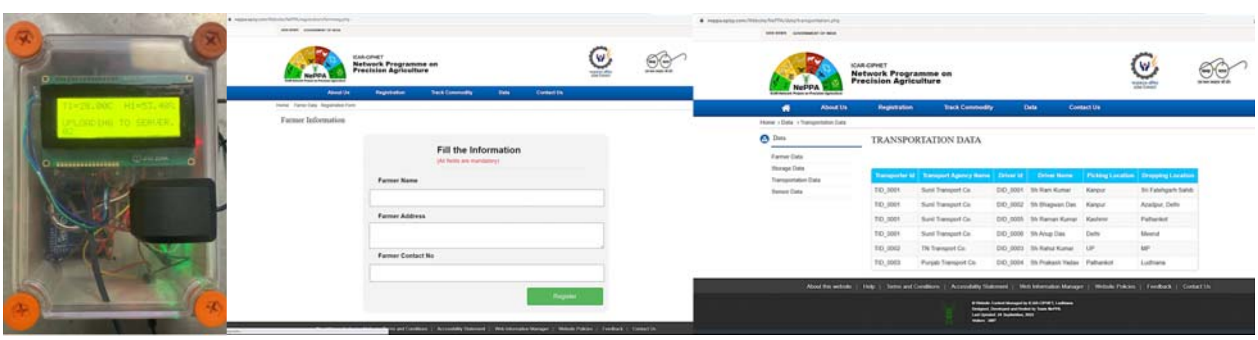


Fig. 21. Sample prototype of sensor-based system for tracking of banana and website under develoment

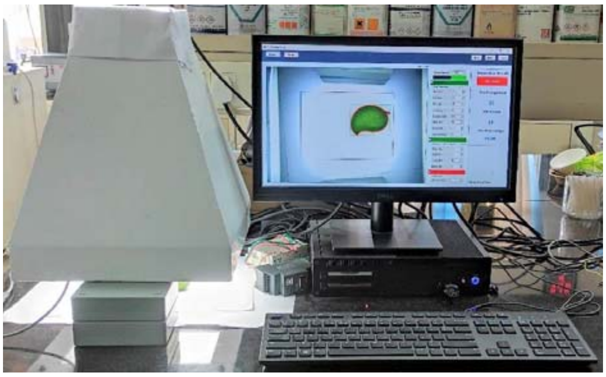


Fig. 22a. Set-up for grading of mango based on the machine vision camera

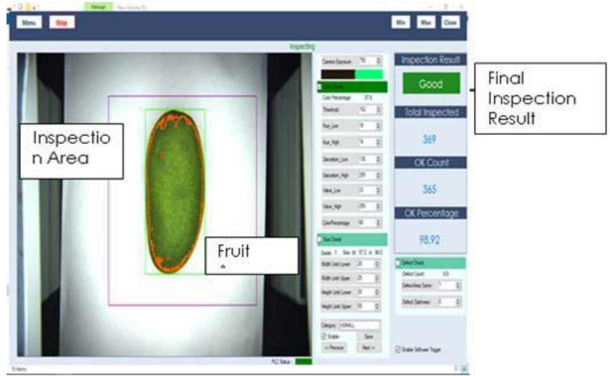


Fig. 22b. Inspection of mango surface using machine vision

1.3.4. *AI based apple detection and localization model for robotic harvester*

For harvesting apple using robots/mechanical systems, it is imperative to detect apples at faster inference speed in real field conditions. Artificial intelligence-based apple identification protocols are developed to identify and detect apples in a real world complex environment under different conditions of natural lighting. The developed models will be integrated into the robotic system for guiding robots to mechanically harvest apples. A project has been initiated in collaboration with CDAC, Kolkata, ICAR-CIPHET, Ludhiana, IIT-Kharagpur and SKUAST-Kashmir, Srinagar to develop a robotic apple harvester. ICAR-CIPHET, Ludhiana has taken responsibility to develop artificial intelligence-based apple identification protocol to guide the robotic arm. Image corpus has been developed for Red velox and Red delicious apple varieties grown in Kashmir region. For experimental purpose images were divided into different categories such as shady images, full length images of trees, closer object images, and sunny sided images. One-stage (YOLO) and two-stage (RNN) based object detection models have been developed for detection and localization of fruits in real time. Different versions of YOLO model (v3, v4, v5, v6 and v7) trained using subsets of datasets. The versions like v3, v4 and v7 validated using k-fold cross validation. Other unofficial versions like v5 and v6 have also been trained to validate the final output of performance. YOLO versions have more inference speed compared to RNN model because they skip the region proposal stage and run detection algorithm directly over sampling of locations. Out of all, YOLO v3, v5, v6 and v7 models selected for further training using multiple subsets of dataset. In comparison results, YOLO v5 & v7 (Fig. 23) outperforms detection on all categories of images (like image containing shady side of tree, sunny side of tree and hidden objects under leaves). Based upon the results of object detection performance, YOLO v5 and v7 models were selected for final integration with ROS of robotic arm.

Fig. 23. Object detection result using (a) Yolo v5 (above) and (b) Yolo v7 (below)

Table 5. Object detection result of different versions of tested YOLO models

Model	F1_Score	Average Precision	mAP (0.5)	mAP (0.5, 0.95)	FPS	FPS (AP_{test})
YOLO v3	0.84	0.83	0.83	0.62	52	0.45
YOLO v5	**0.82**	**0.89**	**0.90**	**0.68**	**83**	**0.48**
YOLO v6	0.87	0.88	0.88	0.63	80	0.45
YOLO v7	**0.96**	**0.92**	**0.92**	**0.64**	**97**	**0.52**

1.3.5. *Anti-obesity properties of soy and groundnut protein*

Metabolic trials was conducted to determine the nutritional quality of soy protein and groundnut protein extracted from oil-seed cake using acid and biological methods at ICAR-NDRI Karnal. The result depicts that Digestibility coefficient (DC), Biological Value (BV), Net Protein Utilization (NPU) of protein extracted using biological method was better than acid extracted proteins. Further, *in-vivo* and *in-vitro* studies were conducted to compare the anti-obesity potential of acid and biological method extracted soy and ground nut proteins and milk proteins. *In-vitro* study provided evidence that protein from both the sources significantly suppresses adipogenesis and stimulates adipolysis in 3T3L-1 cells in comparison to control (Fig. 24). *In-vivo* study showed that mice fed with groundnut proteins (acid and biologically extracted) had lower body weight than mice of the other groups. BMI and Atherogenic index decreased significantly in all the groups in comparison to high fat diet (HFD). Plasma triglycerides and VLDL-C decreased significantly in all the groups in comparison to HFD but the decrease was more pronounced in plant proteins than milk proteins. Adiponectin gene expression also increased significantly in visceral fat tissue in

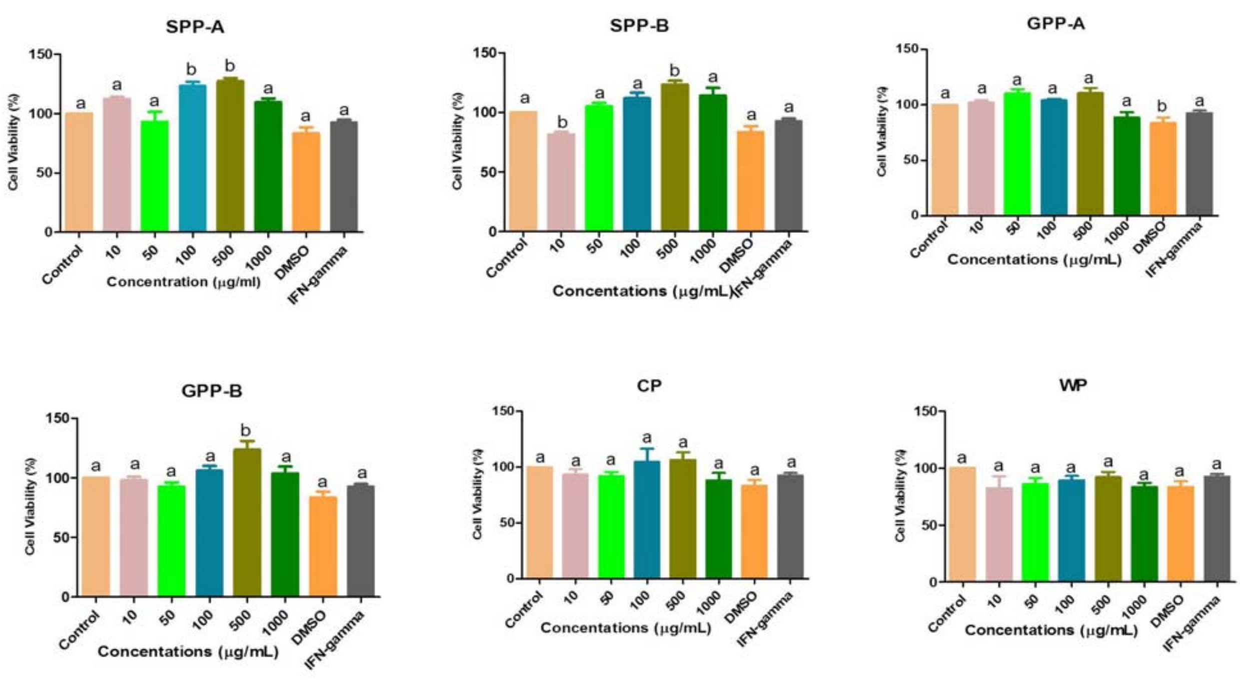


Fig. 24. Effect of proteins on cell viability in 3T3L-1 cells. 3T3L-1 preadipocytes were treated with proteins at various concentrations (10-1000ìg/mL). Data are expressed as mean ± S.E.M of three independent experiments. Significant differences were identified at p<0.05, as compared to the control

groups fed soy protein extracted by biological method and casein whereas leptin gene was down regulated significantly in all the groups except soy protein extracted by acid method. It is evident that oil-seed cake derived proteins extracted by biological method has better anti-obesity potential than acid extracted proteins and soy proteins was better than ground nut protein.

Based on the above results, it can be said that soy protein and ground nut proteins extracted using biological agent showed better nutritional quality and anti-obesity potential than acid extracted proteins.

1.3.6. *Phototactic behavioural response of Sitotroga corcyra and caudra to spectrum of light*

Post-harvest losses of agricultural commodities caused by the insects need to manage at every stage through handling and storage. The commonly accepted and practicing methods include chemical treatments like surface sprays and fumigation. Aluminium phosphide tablets (3g/ton of grains) are the mere available method for bulk storages in India. With its use, there are issues like resistance, residual effect, also ecological and environmental effects. Under field conditions generally the moths are managed through non-chemical options using semiochemicals (pheromones), light and sticky traps. Like field pests, the stored grain moths have been reported to respond to the light.

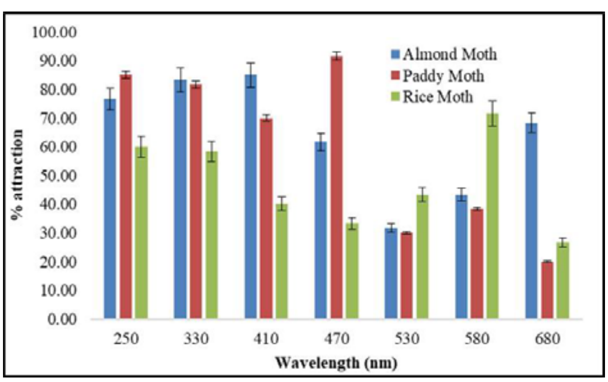


Fig. 25 a. Response of stored grain moths to different colored lights

Therefore, in the present study, phototactic behaviour of moths has been exploited. Light range can be used for attraction and trapping of the insects in the grain storage premises. The experiments were conducted using basic testing chambers developed at ICAR-CIPHET, Ludhiana. Devices like monochromator (Marutek XM-100®) and spectromaster (Sekonic C-700®) were used to study behavior of moths. The phototactic behaviour of three moths *viz*., rice moth, paddy moth and almond moth were recorded (Fig. 25a). The paddy moth showed its higher attraction in wave length of 470±10 nm followed by 250 and 330 nm. Almond moth mainly in the range of 250 to 410 nm later it decreased and showed good response at 680±10 nm. The rice moth attraction was mainly at 580±10 nm and was poorly attracted in other ranges. By fluctuating the dependent variables like voltage and intensity the trapping was optimized. Based on these results, the prototypes have been developed and installed in flour mills at three different locations at Ludhiana, along with the conventional UV light trap (Fig. 25b).

Fig. 25 b. Light trap prototype installed in a flour mill at Hambran Road, Ludhiana

1.3.7. *Processing and marketing of honey*

Beekeepers from SBS Nagar have been trained in the scientific production of high-quality honey using the Honey Processing Unit set up under the Farmer FIRST Project in the farmers field at Rahon. Two beekeepers, Mr. Deepak Singh from Banga village and Mr. Mangal Singh from Shekhupur village started processing their

Fig. 26. Processed honey brand names “Hive honey” and “Mangal honeybee farm”

honey at the established unit on a custom hiring basis. These farmers were guided by the project team to obtain FSSAI registration and are now marketing their products in the market under the brand names Hive Honey” (FSSAI No: 22121690000539) and “Mangal Honey Bee Farm” (FSSAI No: 2212690000130). They retail their processed honey in appropriate packaging at fair prices, which enhanced their income.

1.3.8. *Agro processing cum cattle feed production unit*

Mr Harminder Singh from Raikot, Ludhiana, Punjab, seeing the success of the agro-processing centers established at SBS Nagar District, approached the ICAR-CIPHET, FFP team to set up an agricultural processing and cattle feed production unit. The farmer was scientifically trained to operate the machineries and signed a Memorandum of Understanding (MoU) to hand over wheat mill (capacity 60-70 kg/h) and multipurpose flour mill (capacity 25-30 kg/h) to start the unit. At present, produces various livestock feeds from soybean, wheat, maize, cotton seed etc. and sells its products under the brand name “Vachan Traders”.

Fig. 27. Agro processing cum cattle feed production unit and cattle feed with brand name Vachan Traders

2.1. AICRP on PHET

2.1.1. *Arecanut de-husking and peeling tool - AAU Jorhat*

North-East India, the traditional method of processing of arecanut occurs during 1 ½ to 2 months' time for developing flavour. The nuts are then dug out, de-husked, peeled and cut into sizes before serving. However, the whole process is done manually by using a sharp knife which is tedious and demands special skill. Thus, a machine was developed by a coordinating centre of AICRP on PHET, AAU, Jorhat. The machine can help to reduce human effort and save time for cleaning the areca nut. The tool removes the husk by shearing force. Then the nuts are subjected to a rotary motion around a sharp blade which helps to peel off the tightly adhered skin of the nut. The blades are fixed with a rotating disc which is attached to a circular shaft. The prototype consisted of a motor, shaft, rotating disc, cutting blades and rigid frame. The capacity of the machine is 90-100 pieces per hour.

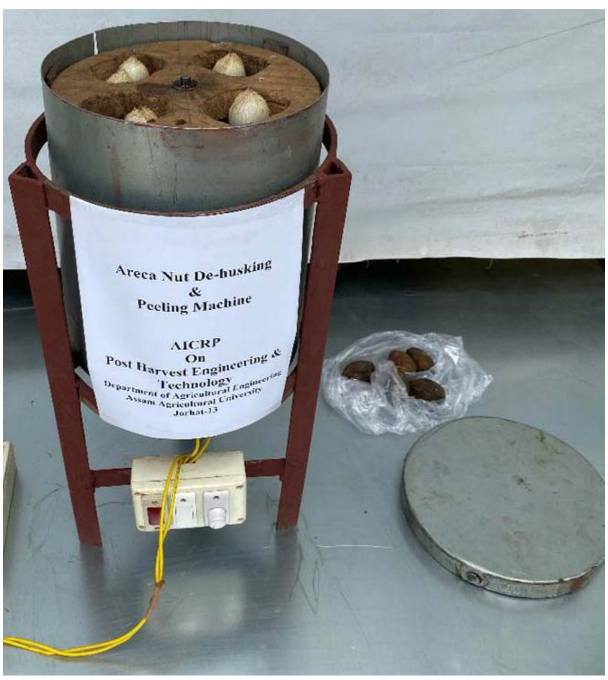


Fig. 28. Arecanut dehusking and peeling tool

2.1.2. *Integrated storage bin for grains - AAU Jorhat*

The shape of the structure is designed conical by making a larger surface at the top and smaller at the bottom part. The capacity of this bin is 200 kg. An outlet is provided at the lower part of the bin for easy unloading of grains. An insect trapping chamber with colour LEDs has been introduced from the cover of the storage bin. The chamber is kept touching the upper layer of the grain inside the chamber. There is a provision for taking out the chamber from the storage bin. The storage is closed tightly. At the lower region of the structure, just below the outlet, a blower is assembled vertically. This blower is powered by solar energy. The air velocity at the top of the storage structure coming out from the blower is around 1.6 m/s. A dehumidifying chamber with silica gel is provided just at the inlet of the blower. Thus, moisture of air is trapped in the inlet of the blower and dehumidified air is supplied to the storage bin to reduce the moisture level of the storage structure. A solar air heater is also provided to supply dehumidified hot air to the storage chamber by using the blower.

Fig. 29. Storage bin with an insect trapping device and solar heating system

2.1.3. *Micro-climate storage bin for groundnut pods- ANGRAU Baptala*

Temperature and moisture are the primary factors that cause seeds to lose their ability to germinate and fluctuations in these speed up

Fig. 30. Micro-climate storage bin for groundnut pods

the process. Excessive seed moisture can contribute to the growth of destructive micro-organisms, attract insect attack, and reduce viability. To check this problem a micro-climate storage bin for groundnut pods has been fabricated having 1.75 × 1.75 × 2.40 m as outer and 1.63 × 1.63 × 2.22 m as inner dimensions of the bin. Prefabricated sandwich Polyurethane foam (PUF) panels with cam lock and rubber gaskets on all sides. All panels fit together by cam lock. Both sides are pre-coated GI sheet with 0.45 mm surface thickness and 60 mm PUF of panel thickness. DX Cooling (direct expansion cooling) with split type refrigeration system having a capacity of 500 kg and temperature maintained to 10-12 °C with relative humidity of 65-80%. Cost of the bin is Rs. 3.0 lakh.

2.1.4. *Cocoa butter extractor - KAU Tavanur*

Cocoa *(Theobroma cacao L.)* is the raw material for the production of chocolate, cocoa butter, cocoa powder, cosmetic items, pharmaceuticals etc. The initial process in the production of cocoa butter from cocoa beans comprises grinding of the cocoa nibs (kernel of cocoa bean) into a thick paste which can be further pressed to form cocoa butter. The resultant cake is pulverized and ground to give cocoa powder. The cocoa butter can be extracted using various mechanical systems like hydraulic press and screw press etc. At present, an ideal hydraulic/screw press suitable for homemade chocolate units is not available. A preliminary study was conducted by using a Universal Testing Machine operated cocoa butter extractor and its performance evaluation was conducted in terms of yield of cocoa butter, time of butter extraction, and extraction efficiency. But its efficiency was found to be low, hence an attempt was made to develop a screw press for cocoa butter extraction which is well suited to small and marginal cocoa entrepreneurs. Accordingly, screw press for cocoa butter extraction has been developed (Fig. 31). Screw type cocoa butter extractor consists of feeding hopper, cylindrical barrel, screw, choke, heating coil temperature control system, pressure control system, cocoa butter outlet and cocoa powder outlet.

Fig. 31. Cocoa butter extractor schematic diagram and developed machine

The machine is made up of a barrel and screw assembly made up of stainless steel 304. The screw rotates within the barrel. The working principle of this machine is the combined effect of friction and pressure exerted by the screw and barrel surface. An additional heating coil (2 kW) is provided over the circumference of the barrel to improve the butter extraction efficiency. The machine has a capacity of 25 kg/h with a power consumption of 2.5 kWh.

2.1.5. *Continuous type UV-C treatment unit for disinfection of food pathogens- UAS Raichur*

The application of ultraviolet (UV) light in the food industry has held great promise for a long time. UV-C light (200–280 nm) possesses excellent germicidal properties to inactivate a wide range of microbial pathogens (e.g., bacteria, fungi, yeasts, molds, and viruses). UVC technology can be used to effectively prevent foodborne illnesses while increasing the shelf life of food without compromising its quality by reducing the microbial load. Thus, the application of UV-C irradiation is an emerging non-thermal technique for the decontamination of food products and hence a continuous type UV-C treatment unit is developed for disinfection of food pathogens. The developed system consists of a box type chamber (3.0×0.5×1.4 m), an end-less wire mesh conveyor/belt, a DC motor (0.25 kW) with variable speed control, UV-C lights (20 No. of each 36 Watt), temperature and conveyor speed indicator and a supporting frame (Fig. 32). It facilitates the entry of food samples to be treated from one end and exit at the other. The intensity of UV-C light and the duration of exposure/treatment can be adjusted depending on the type of the crop/commodity to be treated. The commodities namely, chilli, groundnut and fig fruits prone to aflatoxin were exposed to UV-C light (12195 J/m^2) at a distance of 10 cm for 45 seconds to 15 minutes. The treatment showed very effective against pathogens and safe for the nutrients.

Fig. 32. Continuous type UV-C treatment unit with samples

The treatment resulted in 3 log reduction in bacterial and fungal population whereas significant degradation was noticed in aflatoxin content up to below detection level (BDL) with a minimum change in the nutritional composition extending the shelf-life of chilli and groundnut upto 120 days. The UV-C treatment for 45 seconds found suitable for fresh fig fruits extending the shelf life up to 7 days.

2.1.6. *Nano-silver and nano-zinc compounded active packaging material - OUAT Bhuwaneshwar*

Nano-silver (0.9 %) (Fig. 33) and nano-zinc (0.6 %) (Fig. 34) compounded active packaging material developed using potato starch (1%), carragennan (1%) and glycerol (2%) by solvent casting method. Nano compounded film has enhanced the shelf-life of cut vegetables when compared with control film. Storage of vegetables in the film having anti-microbial activity for shelf-life enhancement. The cost of the product is Rs. 165/ m^2.

2.1.7. *Dal analogues from pigeon pea dal brokens*

Dal analogues were developed by the extrusion process using a cold extruder. The process mainly involved the optimization of composite

Fig. 33. Silver nano compounded film

Fig. 34. Zinc nano compounded film

flour comprising of pigeon pea brokens flour and wheat flour. The pigeon pea brokens flour at different levels *viz*., 90, 85 and 80 per cent were blended with remaining proportion of wheat flour and extruded with three different sizes (4, 5 and 6 mm) of diameter to standardized size of dal. The moisture content being another important extrusion process parameter was achieved by adding water at 20 mL/100g to obtain the final flour moisture content of 25-30 per cent of composite flour. Some pre-treatments or addition of binding agent was imperative. The cost involved in production of dhal analogues was found to be Rs. 35.00 per kg with benefit-cost ratio of 2.5.

The fortification of *dal* analogues was done by considering the optimized treatment (90% Pigeon pea broken flour +10% Wheat flour, 5 mm DD). The nutrient ready mixes *viz*., Ferric pyrophosphate (Fe), Zinc oxide (Zn), Calcium carbonate (Ca) and Vitamin A Acetate (Vitamin-A) were used as per the recommended daily allowances (RDA). Fortified *dal* analogue could be stored up to 6 months.

Preparation of ready to cook *dal tadaka* mix:-All dried optimized ingredients *viz.,* onion cubes, tomato slices, curry leaves, dried garlic, ginger, cumin, mustard, chilli powders were added and mixed with developed *dal* analogue. Ready-to-cook *dal* analogue *tadaka* mix (100 g) Fig. 36a was transferred to a pressure cooker and added 4 cups of water (650 ml). Cooked the mixture for 6 minutes (3 whistles) and left for 5-10 min to release the pressure. Now, the ready-to-eat *dal tadaka* is ready to serve with *chapathi, naan* or rice Fig. 36b. The cost of production of *dal* analogues *tadaka* was found to be Rs. 45.00 per serving.

Fig. 35a. Pigeon pea broken flour (90%): Wheat flour (10%)

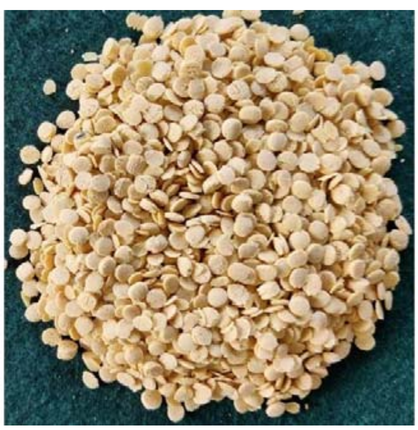


Fig. 35b. Pigeon pea broken flour (85%): Wheat flour (15%)

Fig. 35c. Pigeon pea broken flour (80%): Wheat flour (20%)

Fig. 36a. Ready to cook *dal analogue tadaka* mix

Fig. 36b. Dal analogue *tadaka*

2.1.8. *Process technology for the preparation of foxtail millet based instant upma mix*

Foxtail millet based instant *upma* mix was prepared using millet semolina (100 g), dehydrated vegetables (carrots, green chillies- 5g each) and fried spices (mustard, *jeera*, bengal gram- 5g each). Foxtail millet semolina was obtained by using mini pulveriser followed by sieving. Semolina was dry roasted for 5 minutes, dehydrated vegetables and spices were added to the mix and were packed in HDPE covers. To prepare control sample, foxtail millet semolina in the above mix was replaced with wheat semolina. Results of sensory evaluation revealed higher acceptance of foxtail millet based *upma* mix compared to control. Following parameters were analyzed for both the samples.

Table 6. Comparison of foxtail millet *upma* with control *upma*

Parameters	Foxtail Millet *Upma*	Control *Upma*
Cooking time (min)	10.5	12.5 min
Rehydration ratio	1:4	1:3
Water uptake ratio (%)	60	45
Cooked weight (increased by)	4	5

3.1. AICRP on PEASEM

3.1.1. *Modified design of animal shelter for sheep- SKUAST-K, Srinagar (J&K)*

SKUAST-K, Srinagar (J&K) centre has developed animal shelter for sheep with 9.75m length, 4.57m width, center height 3.11m and sides height 1.82m. The 400µ plastic sheet were covered in square pipe-based structure. The existing animal shelter has an effective ventilation area of 79% with provision of side opening/closing for its optimum utilization (Fig. 36a&b). Temperature range varied from 25-36 °C in the erected animal shelter which is suitable for animal growth and comfort. Loading considerations of the animal shelter found to be satisfactory. After 15th October animals seemed comfortable in the shed during night hours and spent night hours within the shed. Animal performance in terms of physiological parameter (temperature, pulse and respiratory rate) and growth parameters (body weight) were adequate as compared to conventional shelter. Considering space requirement for one animal as 0.9 to 1.10 sq.m. The structure is sufficient for 50 animals in the base area of 44.46 sq. m. The approximate cost of animal shelter is Rs. 1500/m^2.

Fig. 36a. Side ventilation closed at evening time for comfortable atmosphere during night time

Fig. 36b. Side ventilation open during summers

3.1.2. *Off-season cauliflower production in protected cultivation with mulching during rainy season- JAU, Junagadh*

JAU, Junagadh centre has developed the technology for farmers in Saurashtra region using poly-cum-net house (Fig. 37) for off-season cauliflower cultivation during rainy season to achieve higher crop yield and net profit. The yields were found 17.11t/ha with average curd weight 385g. Maximum net income Rs. 2,41,294/- per ha with B:C ratio of 1.67 was achieved.

Fig. 37. Poly-cum-net house for off-season cauliflower cultivation

3.1.3. *Phase change material based assembled fruit ripening chamber'- ICAR-CIPHET, Abohar*

ICAR-CIPHET, Abohar developed phase change material based assembled type fruit ripening chamber. $Na_2SO_4.NaCl.10H_2O$ (eutectic salt) PCM was used in the ripening chamber (Fig. 38). This PCM is prepared by using sodium sulphate (37%), sodium chloride (16%) and water (47%). A total of 48 kg PCM is used in the chamber. Initial freezing temperature of this PCM is 19°C whereas final freezing temperature is 15°C. Cost of the PCM is about Rs. 165 per kg whereas the cost of commercially available PCM (melting temperature 18-19°C) is about Rs. 600 per kg. PCM pouches were prepared using silver laminated polythene film. One pouch contains about 750 g of the PCM. Total number of PCM pouches inserted in walls of ripening chamber is 64. Structural frames of modular type PCM based ripening chamber are made of stainless steel (SS) square pipes and SS sheets. The size of the chamber is 1 m × 1 m × 1.5 m. Composite walls are made of 5 different layers, first layer (inner): SS sheet (26 gauge); second layer: PCM pouches; third layer: SS sheet (26 gauge); fourth layer: insulation (1.75 cm thick thermocol); fifth layer: polypropylene sheet; milky white. PCM pouches are embedded in-between two sheets of SS. Provision have been made to circulate the cool air in-between these two sheets so that PCM can be cooled/charged. A solution of water and

Fig. 38. Prototype of the ripening chamber

ethrel @100 ppm is prepared and to make solution alkaline, NaOH is added. This solution is kept in the chamber to generate ethylene gas for ripening. The ripening chamber is suitable for mango and banana. The capacity of the ripening chamber for mango is 100 kg and cost of the chamber is Rs. 50,000.

3.1.4. *Quality evaluation of mango stored in PCM-based ripening chamber*

The PCM-based ripening chamber is evaluated with the mango fruits and the process is optimized. The ripening process is initiated by the ethylene and optimized the process for ethylene generation using 30 ml of 2-chloroethyl phosphonic acid, 3 l of water + 6 g of NaOH. The mango fruits were treated with different time periods *viz.* 24h, 48h, and 72 h and analysed for shelf-life and ripening of mango fruits. Shelf-life of mango fruits was found to be 19, 14, and

Fig. 39. Physical appearance of mango fruits after treatment in the ripening chamber and control fruits

9 days with the treatments for the 24h, 48h, and 72 h, respectively. In 72 h treatment, the physiological loss of weight (PLW) is found 18% after 13 days while the total sugar is found 11.4% and 23.7% in control and treated fruits respectively. In 48 h treatment, the PLW is slightly higher in treated fruits than the control and is observed about 18.2 % and 19.9% after 19 days in control and treated fruits respectively, while total sugar is 22.2% and 32.6% in control and treated fruits after 19 days respectively. Furthermore, in treatment for 24 h the physiological loss of weight is found 25.8% and 27.5 % in control and treated fruits after 19 days while total sugar is 19.4% and 25.4% in control and treated fruits, respectively.

3.1.5. *Polyhouse for round the year mushroom production in mid-temperate region- CAEPHT, Gangtok*

Doubling farmers' income is a challenge in the hilly states like Sikkim where farm holdings are small and marginal. Sikkim being a tourist place, mushroom has a big market and can fetch good income to farmers. But there was no design of polyhouse and package of practices available for mushroom cultivation. To generate economically viable technologies for mushroom farming, CAEPHT, Gangtok, developed a polyhouse specially for round the year mushroom production in mid-temperate region. The dimensions of the polyhouse are 9 x 6 x 4.6 m. The floor of the polyhouse is 0.9 m below the ground surface to maintain microclimate in the structure. The cladding material used is black colour LDPE film. Lighting system and humidifier have also been provided in the structure. The solar panel is also installed in the polyhouse to meet the energy requirements. The cost of the polyhouse is Rs. 3.5 lakh. In a year 2.5 to 3.0 ton mushroom can be produced and net income of Rs. 5 lakh can be earned.

3.1.6. *Modified evaporative cooled chamber (ECC)- BAU Ranchi*

The existing design of zero energy evaporative cooled chamber (ECC) has been modified for Ranchi plateau by BAU Ranchi centre for on-farm storage of vegetables. The modified design of ECC ensures better environment control to enhance shelf life of vegetables. A model of ECC having length 2.4 m, width 1.5 m and height 1.8 m has been constructed. The modified ECC is fitted with forced cooling fan-pad system operational using solar power. The capacity of the structure is 400 kg (20 crates of 20 kg). The storage structure is of double walled/parallel walls type of 2.5 m in which cooling pads were fixed. The cavity between two walls is 8cm which is filled with river sand. The top head of the structure is covered with the matt made of palm leaf. The top view, side view and isometric view is shown in figure. The front wall of 2.5 m consists of two exhaust fan and

Fig. 40. Polyhouse for round the year mushroom production

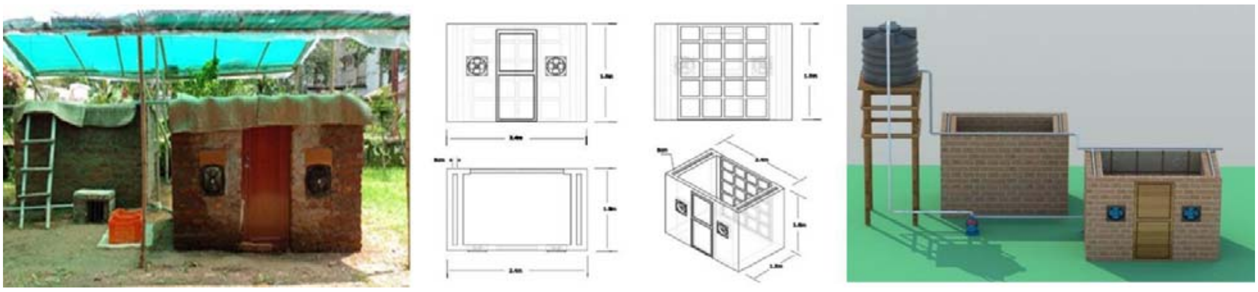


Fig. 41. Modified evaporatively cooled chamber

door. Humidity of 85-90% and Temperature of 8-10°C lower than the ambient temperature is maintained in the ECC against outside temperature of 40-42°C and RH of 50-55%. Shelf life of leafy vegetables like spinach, lettuce, okra and cabbage etc. is extended to 4-6 days. The approximate cost of the structure is Rs 60,000.

3.1.7. *GI wire joints technology for Bamboo polyhouses- DBSKKV, Dapoli*

Small and marginal farmers are mostly using bamboo as structural material for making frame of polyhouse. The bamboo is used as an alternative construction material for developing low-cost polyhouses as the cost of metal polyhouses is one of the constraints in their adoption by the farmers. Durability and stability of the structure depends on the joints. DBSKKV, Dapoli centre developed GI-wire joints technology for bamboo polyhouses. Brackets along with nut bolts were used for standard joint-making fixtures which are fabricated of MS flats incurring higher cost and requiring more time. Therefore, as an alternate solution, Dapoli centre has invented and standardized cost-effective, reliable, and faster technology for bamboo joints using GI wires (Fig. 42a&b).

3.1.8. *Fabrication and installation of automated plant factory prototype - PAU Ludhiana*

To promote urban and vertical horticulture, a plant factory (Fig. 43a-c) was fabricated and installed in an unused room at PAU Ludhiana. The factory consists of four tier for hydroponic cultivation (growing plants without soil) using artificial light. The components of the plant factory include insulation system, racks (2), artificial lighting system, Carbon dioxide supplementation and monitoring, temperature and humidity control, automated electric

Fig. 42(a). Side joints between bottom chord and side column

Fig. 42(b). Joints between center column, rafter and purlin

Fig. 43a. Automatic Temperature & Humidity Controller

Fig. 43b. Nutrient dosing system

Fig. 43c. CO_2 generator and sensor

Table 7. Specification of the automated plant factory

Total plant factory size	24.4 ft × 12.1 ft × 8.7 ft
NFT channel	100 mm × 50 mm
One rack dimension	15.2 ft × 4 ft × 8.5 ft
No: of holes per NFT channel	27
No: of 22-Watt full spectrum LED lights	160
Capacity of acid, fertilizer tank (l)	20
Capacity of nutrient solution tank (l)	200
Total plant capacity (No:)	1296

generation system for 24x7 power supply, automated fertigation system, UV filtration of the leachate, oxygation system double door entry system with air curtain. All the parameters can be monitored remotely.

3.1.9. *Plastic-based hanging type feeders suited for all breeds of goats- ICAR-CIRG, Makhdoom*

The hanging type plastic feeders (Fig. 44a&b) are fabricated with 1.25-inch iron angle, 1.25-inch flat iron, half-cut one-foot width PVC water pipes and FRP sheet. The length of the feeder is kept at 1.5 meters, width of the feeder tray is 30 cm and top portion width is 40 cm. The feeder is designed in such a way that no feed/ *bhusa*/ green will fall outside the tray, so that feed/ fodder loss is reduced to negligible. The width at top portion as well as distance between iron rods were standardized which holds the *bhusa*. In this feeder, *bhusa* doesn't fall in feeding tray fully by itself like in two sided feeders (*bhusa* will fall in the feeding channel while animal feeds upon it). The plastic-based

Fig. 44a. Hanging type feeder for kids

Fig. 44b. Hanging type feeder

hanging type feeders are suitable for the field conditions where there is space constraint. It can be hanged in one side of the shelter; adequate space can be saved in already overcrowded shelter. It is portable, can be shifted whenever required and height adjustable so that same feeder can be used for different goat breeds by hanging it at different heights as per requirement. Total cost for making plastic-based hanging type feeder with fiber sheet (iron mesh mounted) is Rs. 8000.00 and hanging type feeder without fiber sheet (wall mounted) is Rs. 6000.00.

3.1.10. *Automatic shading system-DBSKKV, Dapoli*

An automatic shading system has been developed and installed in the polyhouse at DBSKKV, Dapoli. The automatic shading system is required to check the excess radiations entering the polyhouse. It works on the photosynthetically active radiation (PAR) which designates the spectral range (wave band) of solar radiation from 400 to 700 nanometers. The plants use PAR in the process of photosynthesis. Photons at longer wavelengths do not carry enough energy to allow photosynthesis to take place and this automated shading system is turned ON when incoming radiation exceeds this value to maintain congenial temperature for the crop inside the polyhouse. In the system, 50% shade net is used inside the polyhouse for maintaining temperature and PAR. This shading system saves at least 6-8 kW of electricity daily as there will be less operation of fan pad cooling system. The approximate cost of an automated shading system is Rs. 35000/-. The auto-shading system overcomes the slipping of the chain into the sprocket and overlapping of rope by fitting a bearing on a pipe for sprocket support and a bearing fitted on the motor shaft for shaft support. The different mechanical arrangements in the system are shown in fig. 45.

Fig. 45a. Clamps and nut bolt fitting system to the chain sprocket and motor fitting of the automatic shading system

Fig. 45b. Fully closed shade net

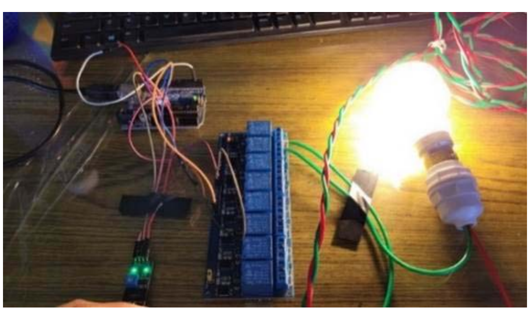


Fig. 45c. Automation work for PAR control using Arduino Uno

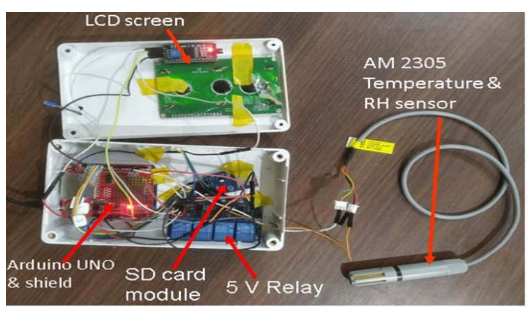


Fig.45d. Components of automatic controller for the fogging system

4.1 CRP on SA

4.1.1. *Extraction of Starch and Protein from Tamarind Seeds - TNAU, Kumulur*

Starch and protein from tamarind seeds was extracted by defatting tamarind kernel powder after roasting, dehulling and pulverization of tamarind seeds. Solvent extraction method is employed to remove oil from the seeds. Defatted tamarind powder was blended with 70% ethanol and 0.1 M NaOH for 5 min in each solvent, respectively. The filtrate was centrifuged at 11000 rpm for 15 min. The powder residue thus obtained was mixed with water, re-filtered twice using 200 mesh screen and washed successively with 0.1 M NaOH and deionized water. The supernatant of each extract was collected separately and used for the estimation of protein fraction. The starch powder obtained was dried in oven at a temperature of 50°C till it reaches constant weight and stored for further analysis. The protein fraction from the supernatant was precipitated by addition of chilled acetone and kept overnight at refrigeration temperature. The supernatant with acetone was centrifuged at 5000 rpm for 20 min. The protein precipitated after centrifugation is again washed with acetone and distilled water. The protein pellets obtained are dried in hot air oven at the temperature of 35°C. Recovery of starch was 57.6% and that of protein was 12.3%.

Fig. 46 a. Raw seeds b. Roasted dehulled seeds c. Roasted defatted kernel powder

4.1.2. *Storage protocol for roasted makhana seeds-ICAR-CIPHET*

Effect of different packaging materials (15μ LDPE, 25μ LDPE, 80μ LDPE, BOPP) on storage period and popping behavior of roasted *makhana* seeds were studied. It was reported that popped *makhana* recovery (%) was stable during 4 months of storage period in 25μ LDPE, 80μ LDPE, BOPP packaging. However, popped *makhana* recovery (%) for roasted seeds in 15μ LDPE reduced after 60 days of storage. Similar trend was observed in popping efficiency (%). No significant difference was observed in FTIR characteristics of fresh roasted *makhana* seeds, stored *makhana* seeds and popped *makhana*. Results for particle size analysis through dynamic light scattering showed particle size of 977.43 nm, 2389.52 nm, 1634.14 nm, 1280-3090 nm in raw *makhana* powder, fresh roasted seed powder, stored roasted seed powder and popped *makhana* powder respectively. Nanoparticles (5.4%) of size 43.8-58.8 nm was recovered from popped *makhana* powder. Relative crystallinity in XRD analysis for raw *makhana*, fresh roasted *makhana* seed, popped *makhana* and stored roasted seed was found to be 31%, 22.5%, 25.7% and 30% respectively.

4.1.3. *Raw makhana seed collection system*

A mechanized system for collection operation of *makhana* seeds was designed using a pipe sliding mechanism with suction inlet and slurry pump. The collection system was equipped with 5mm slotted screen for collection of seeds with water from dredge. The limiting factors in the present system was buoyancy, stability of the float, controlling depth of the collector, direction of water flow, operator sitting arrangement and assessment of seed concentration and screen clogging.

Fig. 47. Raw *makhana* seed collection system

4.1.4. *Glycemic index of popped makhana-ICMR-NIN Hyderabad*

Comprehensive nutritional profile assessment including proximate composition, vitamins, carotenoids, minerals, phytic acid, fatty acid composition, carbohydrates and *in-vitro* starch digestibility, polyphenolic compounds, and antioxidant potential of raw *makhana* seed and puffed *makhana* was carried out at ICMR-NIN Hyderabad. Sensory acceptability study using hedonic scale of *makhana* and its value-added products (popped *makhana*, spice mixed *makhana* and *makhana* kheer mix) was conducted. Glycemic index and glycemic load of *makhana* pops was estimated to be 68.7 and 17, respectively. It was concluded that seasoned *makhana* pops is a recipe with medium glycemic index and medium glycemic load.

Awards & Recognition

Name of Awardee	Name of Award
भा.कृ.अनु.प.–सीफेट	नगर राजभाषा कार्यान्वयन समिति (न.रा.का.स.), लुधियाना द्वारा न.रा.का.स. स्तर पर श्रेष्ट कार्य निष्पादन हेतु सीफेट, लुधियाना को 10 फरवरी, 2022 को राजभाषा पुरस्कार से सम्मानित किया गया।
प्रसंस्करण प्रगति	केन्द्रीय कार्यालयों की श्रेणी में तृतीय पुरस्कार के साथ ही संस्थान द्वारा प्रकाशित राजभाषा पत्रिका 'प्रसंस्करण प्रगति' को भी पुरस्कृत किया गया।
Chandan Solanki S K Gupta M S Alam	Best paper award for "Impact of Continuous Microwave Pre-Milling Treatments on Chickpea for Enhanced Recovery" by ICAR-IGFRI, RRS, Srinagar, ICAR-NAHEP BAU, Ranchi and NGDC, Baramulla at University of Kashmir, Hazratbal, Srinagar, Kashmir during 28-30 September 2022
Chandan Solanki	Best Ph.D. Thesis Award by Green Planet Agrotech Foundation for the thesis entitled "Design and development of continuous pre-milling treater for improved recovery from selected pulses"
	Young Scientist Award by Green Planet Agrotech Foundation for his services done at ICAR-CIPHET, Ludhiana on 26 November 2022
Sandeep Mann Renu Balakrishnan Sachin Mittal Yogesh Kalnar Sandeep Dwange	Best oral presentation award for paper entitled "Role of On-farm Processing in Increasing Farmer's Income in 56th ISAE Convention of Indian Society of Agricultural Engineers on "Agricultural Engineering Innovation for Global Food Security" International Symposium on "India @2047: Agricultural Engineering Perspective" during 09-11 November 2022 held at TNAU, Coimbatore, Tamil Nadu
Sandeep Mann Renu Balakrishnan Rahul K Anurag Yogesh Kalnar B V C Mahajan A K Dixit	ISAE team award 2022 during 56th ISAE Convention of Indian Society of Agricultural Engineers on "Agricultural Engineering Innovation for Global Food Security" International Symposium on "India @2047: Agricultural Engineering Perspective" during 09-11 November 2022 held at TNAU, Coimbatore, Tamil Nadu
Armaan U Muzaddadi	Certificate of Merit from Department for Environment Food & Rural Affairs (DEFRA), The World Bank and Confederation of Indian Industry
Surya Tushir	Best Scientist Award for the year 2022 on the occasion of 34th Foundation day of ICAR-CIPHET on 03 October 2022
Swati Sethi	Most Cited Research Paper Award (JFST) during the last five years for the paper entitled "Plant-based milk alternatives an emerging segment of functional beverages - A review"
Pankaj Kumar	Wiley - Top cited paper in Journal of Texture Studies 2021-22. Kumar, P., Kaur, C., & Jambh, H. K. (2021). Rheological, textural, and technological modifications in wheat unleavened flatbread substituted with extruded finger millet. Journal of Texture Studies, 52(3), 400–409. https://doi.org/10.1111/jtxs.12595
Vikas Kumar	वर्ष 2020–21 के दौरान राजभाषा हिंदी के श्रेष्ठ निष्पादन हेतु उनके संस्थान को प्रदत्त तृतीय पुरस्कार प्राप्त करने में विशेष योगदान देने हेतु प्रशस्ति पत्र प्रदान किया गया।
	Best Oral Presentation Award under theme "Fisheries Post Harvest Technology and Value Addition" during 1st Indian Fisheries Outlook 2022 held at ICAR-CIFRI, Barrackpore during 22-24 March 2022

Name of Awardee	Name of Award
	काव्य पाठ प्रतियोगिता में नगर राजभाषा कार्यान्वयन समिति द्वारा पुरस्कार से 01 अक्टूबर 2022 को 3.30 (अपराह्न) बजे आयकर भवन, ऋषि नगर, लुधियाना में सम्मानित किया गया।
B. M. Ghodki	Young Researcher in Agricultural Structures & Process Engineering category in Agricultural Sciences discipline conferred by Venus International Foundation held during 9^{th} Venus International Research Awards (VIRA 2023) & 9^{th} Annual Research Meet – ARM 2023 on 7 January 2023 at Chennai
Mahesh Kumar Samota	Young scientist award on IV^{th} International conference in hybrid mode on “Innovative and current advances in agriculture & allied sciences” during 12-14 June 2022 held at Himachal Pradesh University, Summer Hill, Shimla, Himachal Pradesh
	Bronze in shot put (Men) during ICAR Zonal Tournament (North zone) held at ICAR-IISWC, Dehradun from 23-26 November 2022
Shaghaf Kaukab	Silver medal in chess event during ICAR Zonal Tournament (North zone) held at ICAR-IISWC, Dehradun from 23-26 November 2022
Rupender Kaur	Young Scientist Award by Society of Tropical Agriculture, New Delhi awarded during 14^{th} International Conference on Agriculture, Horticulture and Food Science held during 17-18 December 2022 at New Delhi
Vishal Kumar	नगर राजभाषा कार्यान्वयन समिति द्वारा आयोजित राजभाषा प्रोत्साहन मास के दौरान हिंदी भाषण प्रतियोगिता में विशेष पुरूस्कार।

निदेशक, सीफेट नराकास (लुधियाना) द्वारा राजभाषा पुरस्कार प्राप्त करते हुए

Smt Surya Tushir receiving Best Scientist Award for the year 2022 during 34th Foundation Day of ICAR-CIPHET

Dr. Sandeep Mann receiving ISAE Team Award 2022 during 56th ISAE Convention

Dr. Vikas Kumar receiving best oral presentation award during 1st Indian Fisheries Outlook 2022

श्री विशाल कुमार, हिंदी भाषण प्रतियोगिता में विशेष पुरूस्कार प्राप्त करते हुए

Academic Excellence & Recognitions

Ph D

Name of Awardee	Name of Award
Vikas Kumar	Awarded Ph D (Fish Quality Assurance and Management) from Tamil Nadu Dr. Jeyalalithaa Fisheries University, Nagapattinam on 20 June 2022 for thesis entitled “Ultrasound and Microwave Assisted Enzymatic Extraction of ACE inhibitory Peptides from Rohu Fish Waste”
Chandan Solanki	Awarded Ph D (Processing and Food Engineering) from Punjab Agricultural University, Ludhiana on 29 August 2022 for thesis entitled “Design and Development of Continuous Pre-Milling Treater for Enhanced Recovery from Selected Pulses”
Dhritiman Saha	Awarded Ph D (Engg) from School of Engineering, University of Guelph, Ontario, Canada on 11 October 2022 for thesis entitled “Evaluation of Machine Learning Techniques for Image Based Quality Assessment of Chickpea” under ICAR-Netaji Subhas International Fellowship 2018-19

Institute Technology Management Unit (ITMU)

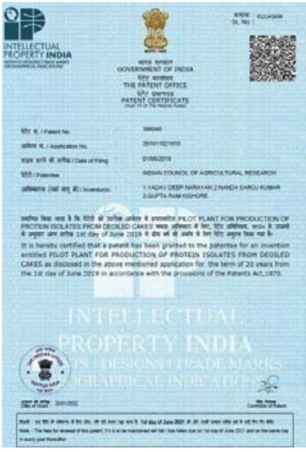
The Institute Technology Management Unit is responsible for IP protection, Management and Transfer/Commercialization of technologies developed by the Institute. ITMU plays a crucial role in management of technologies. The role of ITMU is to encourage and accelerate the efforts towards development of technologies in the field of post-harvest management and to facilitate the transformation of ideas, inventions and technologies developed by the Institute into commercial ventures to serve the society. ITMU since its inception has been involved in protection, management and commercialization of Intellectual property generated by the institute. A total of 71 patent applications have been filed through ITMU so far, out of which 26 patents have been granted. Regular and sturdy efforts of ITMU lead to commercialization of 80 technologies developed by ICAR-CIPHET. During 2022, the institute was granted five patents and one copyright. Seven technologies were licenced to eight licencees generating a total revenue of 8.62 lakh.

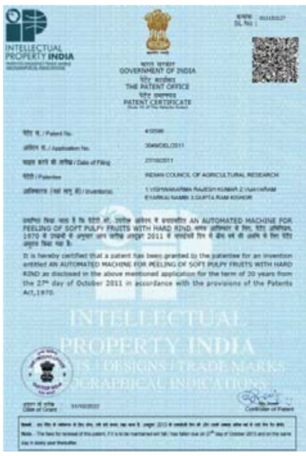
Patent Granted

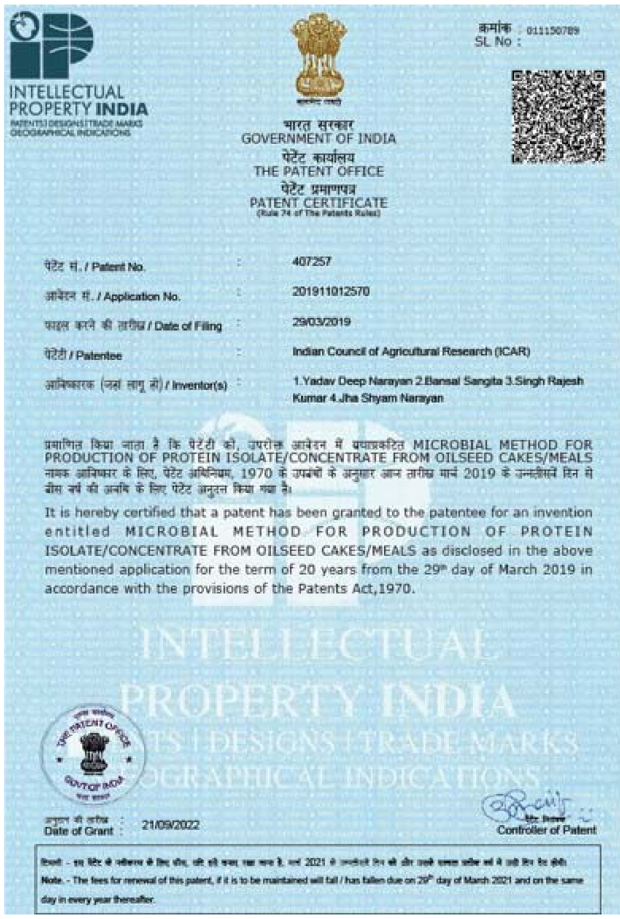
Title	Application No:	Inventors	Date of Grant	Patent No:
Pilot plant for production of protein isolates from deoiled cakes	201911021833	Dr D N Yadav Dr S K Nanda Dr R K Gupta	20.01.2022	386949
Low fat meat emulsion and process for making the same	2351/DEL/2013	Dr Yogesh Kumar Dr K Narsaiah Dr Tanbir Ahmed	23.03.2022	392629
Live fish carrier system and method of transportation of live fish therein	201611032728	Dr A U Muzaddadi Dr S K Nanda	31.05.2022	398167
Microbial method for production of protein isolate/concentrate from oilseed cakes/meals	201911012570	Dr D N Yadav Dr Sangita Bansal Dr R K Singh Dr S N Jha	21.09.2022	407257
An automated machine for peeling of soft pulpy fruits with hard rind	3049/DEL/2011	Dr R K Vishwakarma Dr V E Nambi Dr R K Gupta	31.10.2022	410596

Copyright Granted

Title	Copyright No	Inventors	Date of Grant
Graphic user interface for estimating the freshness of white button mushrooms	SW-15614/2022	Dr A D Arjun Dr S K Chakraborty Dr Nachiket Kotwaliwale	13.07.2022







क्रमांक : 011150789
SL No :

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE
पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No.	:	407257
आवेदन सं. / Application No.	:	201911012570
फाइल करने की तारीख / Date of Filing	:	29/03/2019
पेटेंटी / Patentee	:	Indian Council of Agricultural Research (ICAR)
आविष्कारक (जहां लागू हो) / Inventor(s)	:	1.Yadav Deep Narayan 2.Bansal Sangita 3.Singh Rajesh Kumar 4.Jha Shyam Narayan

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित MICROBIAL METHOD FOR PRODUCTION OF PROTEIN ISOLATE/CONCENTRATE FROM OILSEED CAKES/MEALS नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख मार्च 2019 के उन्तीसवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled MICROBIAL METHOD FOR PRODUCTION OF PROTEIN ISOLATE/CONCENTRATE FROM OILSEED CAKES/MEALS as disclosed in the above mentioned application for the term of 20 years from the 29th day of March 2019 in accordance with the provisions of the Patents Act,1970.

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

अनुदान की तारीख
Date of Grant : 21/09/2022

पेटेंट नियंत्रक
Controller of Patent

Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on 29th day of March 2021 and on the same day in every year thereafter.

Technology Commercialized

Technology	Firm	Licensing Fee (Rs in Lakh)*	Date of Licensing
Live fish carrier system and method of transporting live fish	Raftaar Professional Engineering Company, ID-STEP, GNDC, Ludhiana, Punjab	1.00	23 Feb 2022
Microbial method for production of protein isolate/concentrate from oilseed cakes/meals	Trishveda Naturals Pvt Ltd, Ludhiana, Punjab	3.00	28 Feb 2022
	BNK Agri Foods Pvt Ltd, Omaxe Riviera, Rudrapur, Udham Singh Nagar, Uttarakhand	3.00	1 Aug 2022
Process for quality protein maize-based gluten free muffins	Whisk Journey Private Limited, Flat No. KM00140803, KOSMOS, Jaypee Greens Wish Town, Sector-134, Noida, Gautam Buddha Nagar, Uttar Pradesh	0.11	21 Jun 2022
Jamun bar preparation process	Mr Subhash Chandra, Vasant Vihar Enclave, Dehradun, Uttarakhand	0.16	2 Jul 2022
Autoclavable microencapsulation system with multistage breakup two fluid nozzle for clean production of microcapsules	Bio-Age Equipment & Services Plot No,468, J.L.P.L, Industrial Park, Sector-82, Mohali, Chandigarh	1.00	03 Oct 2022

Technology	Firm	Licensing Fee (Rs in Lakh)*	Date of Licensing
Cereal-gluten free pasta with semi-popped makhana	Saurath Agro Private Limited, Balbharpur, Laheriyasarai Darbhanga, Bihar	0.25	13 Oct 2022
Taro peeling machine	A. B. Engineer's, Plot No. 09, RP Industrial Estate, Phase 7, near Durga Colony, Focal Point, Ludhiana, Punjab	0.10	20 Oct 2022

**Excluding GST @ 18%*

Glimpses of technology transfer

Linkages & Collaborations

MoU Signed

Institution	Date
Sant Longowal Institute of Engineering and Technology, Longowal, Sangrur, Punjab	09 Feb 2022
Nebulaa Innovations Private Limited, Hyderabad, Telangana	14 Feb 2022
AgNext Technologies Pvt.Ltd., Sector 75, Mohali, Chandigarh	17 May 2022
Chandra Shekhar Azad University of Agricultue & Technology, Kanpur, Uttar Pradesh	15 Jun 2022
a-IDEA - Association of Innovation Development for Entrepreneurship in Agriculture, Centre for Agri-Innovation, ICAR-NAARM, Hyderabad, Telangana	08 Jul 2022
Central Agricultural University, Lamphelpat, Imphal, Manipur	01 Aug 2022
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra	17 Oct 2022
Indo-German Chamber of Commerce	04 Nov 2022
Centrifugal Products, Plot No. 4, Balda Industrial Estate, G.I.D.C., Killa Pardi, Valsad, Gujarat	04 Nov 2022

Agri Business Incubation Centre (ABI)

The Agri-Business Incubation Centres of ICAR provide support to the farmers, entrepreneurs and young unemployed youth by generating new technologies and machineries, creating path to access latest agricultural technologies, by providing suitable need-based services. ABI Centre offers its services to farmers/ entrepreneurs/unemployed youth/women entrepreneurs along with small and medium scale industries to get benefit from ICAR-CIPHET developed agro based technologies for income and employment generation. Through this centre, the Institute has conducted number of trainings, awareness/sensitization programs to more than 500 participants and also acts as incubation centre for the startups. During 2022, ABI center has organized three sensitization programmes and provided incubation to four entrepreneurs.

Sensitization Programs Organized

Title	Venue	Date	No of Participants
Agribusiness opportunities for rural women	Malakpur Bet, Ludhiana	25 Mar 2022	15
Agro processing	Government Senior Secondary School, Ayali Khurd, Ludhiana	30 Mar 2022	20
Agribusiness incubation facilities at ICAR-CIPHET	Pratap College of Education, Ludhiana	31 Mar 2022	25

Incubation Provided

ICAR-CIPHET signs MoA with a budding female entrepreneur of Ludhiana

A Memorandum of Agreement (MoA) was signed with Ms. Navnoor Kaur on 15 February 2022, a budding female entrepreneur for incubation on value added products from jaggery. The incubatee Navnoor Kaur has developed various value-added products mixed with roasted dry fruits. She has launched her start-up firm M/s Jaggercane and their products are available on their website www.jaggercane.com and e-commerce platform Amazon. Presently, she is manufacturing different types of value added crunchy jaggery crumbs without using any preservatives and chemicals.

MoA signed between ICAR-CIPHET and Mr Pushpinder Singh, for processing of agricultural commodities

Agro-processing stimulates the value addition, increased nutritional value, increased food security, through a reduction in food spoilage and wastage. In order to start agro based processed products, Ludhiana based young and dynamic entrepreneur Mr. Pushpinder Singh came forward to prepare value added products from dal, spices, oilseeds etc. ICAR-

CIPHET signed MoA with him on 12 May 2022 for providing incubation facilities to process agricultural produce for further marketing.

MoA signed with HAUCH for converting agri-residue to mycelium-based boards for industrial applications

With its second largest agro-based economy and year-round crop production, India produces a lot of agricultural waste, including crop residues. Burning crop residue has grown into a serious environmental problem that threatens human health and causes global warming. Mycelium growth provides a unique and low-cost bio-fabrication method to recycle the agricultural wastes/crop residue and byproducts into sustainable biomaterials. Ms. Poonam Sharma, Director, HAUCH Ecovations Pvt. Ltd. Ludhiana approached ICAR-CIPHET for incubation for converting agri-residue to mycelium-based boards for industrial applications and MoA for the same was between ICAR-CIPHET and the firm on 28 November 2022.

MoA signed for incubation of groundnut processing with Mr Samrat R Singh

Mr. Samrat R. Singh from Ludhiana approached CIPHET for incubation facility of groundnut processing, as groundnut-based products are loaded with protein and fibre, antioxidant properties along with aids in preventing cancer, regulate blood sugar and being low fat makes it critically important for individuals on diets or people who have to enhance their overall health. A MoA for incubation was signed between him and ICAR-CIPHET on 21 December 2022.

Post-Harvest Machinery and Equipment Testing Centre (PHMETC)

The Post-Harvest Machine and Equipment Testing Centre (PHMETC), ICAR-CIPHET, Ludhiana is approved by Mechanization and Technology Division, Department of Agriculture & Cooperation, Ministry of Agriculture and Farmers' Welfare, Govt. of India, New Delhi. The institute is authorized for testing of all types of post-harvest equipment and machinery to ensure supply of quality post-harvest equipment and machinery by processing equipment and machinery manufactures to the end users. This is a unique facility in the country, available at ICAR-CIPHET for testing of post-harvest technology equipment and machinery. Purpose of establishment of PHMETC at ICAR-CIPHET, Ludhiana (Punjab) is to provide a platform and develop confidence in manufacturers and buyers / entrepreneurs involved in PHT machine and equipment. PHMETC at ICAR-CIPHET is testing all machines related to processing of agricultural and allied produces. The PHMETC has tested 79 machines during 1 January -31 December 2022 earning a total testing fee of Rs 1.42 Crore.

Name of Machine	Manufacturer
Mini Dal Mill	Sharayu Entreprises, Akola, Maharashtra
2 in 1 Pulverizer (2 hp)	Dharti Industries, Rajkot, Gujarat
Domestic Flour Mill (1 hp)	
Mini Oil Expeller	
Mini Oil Expeller	
SS Pulverizer (Flour Mill 2-in-1) (3 hp)	
Mini Rice Mill	
Mini Rice Mill	New Bihar Selar Udyog, Champran, Bihar
Multi Grain Cleaner Winnower Fan	Aman Agro Tech, Barnala, Punjab
Power Operated Pulverizer	Sidhharth Enterprises, Durg, Madhya Pradesh
Briquette Making Machine	Sunny Engineering Works, Patiala, Punjab
Dung Log Making Machine	
Dung/ Waste Dewatering Machine	
Mini Dal Mill (5 hp)	Band Brothers Agri Machineris, Akola, Maharashtra
Mini Dal Mill (3 hp)	
Mini Rice Mill (Tractor Operated)	Binod Engineering, Bhojpur, Bihar
Cleaner cum Grader	Prajakta Agro Machinery, Akola, Maharashtra
Mini Dal Mill (5 hp)	

Name of Machine	Manufacturer
Mini Dal Mill (5 hp)	S K Engineering Works, Akola, Maharashtra
Mini Dal Mill (3 hp)	
Mini Oil Mill/ Expeller	Asom Agro Tech Pvt Ltd, Guwahati, Assam
Potato/ Banana Chips Making Machine	
SS Pulverizer 2-in-1 (Double Chamber) (3 hp)	
Mini Rice Mill	
Seed/Grain Cleaner cum Grader	Shivraj Agro Industries, Pune, Maharashtra
Mini Dal Mill	
Rice Huller with Polisher	B K Engineering Workshop, Hojai, Assam
Potato/ Banana Chips Making Machine	
Oil Expeller with Filter Press	
Mini Oil Mill/ Expeller (5 hp)	
Mini Rice Mill (3 hp)	
Portable Rice Mill (Tractor PTO Operated)	
Double Chamber Pulveriser 2-in-1 (3 hp)	
Mini Rice Mill with Grader and Blower	
Cow Dung Briquetting Machine	Cowzone, South Extension-I, New Delhi
Destoner Machine (4-5 tph)	Osaw Industrial Products Pvt Ltd, Ambala, Haryana
Fine Cleaner cum Grader (4-5 tph)	
Seed/ Grain Pre Cleaner (8-10 tph)	
Seed/ Grain Cleaner/ Grader	
Specific Gravity Separator	
Fine Cleaner cum Grader	
Specific Gravity Separator	
Destoner	
Seed Grader	
Mini Dal Mill (3 hp)	Veerba Agro, Akola, Maharashtra
Mini Oil Mill	M G Industries, Batala, Punjab
Rubber Roll Sheller cum Polisher	
Mini Mutipurpose Flour Mill	
All in One Mini Dal Mill (5 hp)	Ashish Industries, Akola, Maharashtra
Seed/ Grain Cleaner cum Grader	S K Agro Industries, Ambala, Haryana
Seed/ Grain Cleaner	Dhiman Agro Industry, Patiala, Punjab
Mini Dal Mill (5 hp)	Maa Durga Plastic Products, Akola, Maharashtra
Mini Dal Mill (3 hp)	
Multi Grain Cleaner Winnower	Gill Agro Industries, Tarn Taran, Punjab
Mini Dal Mill (3 hp)	Shri Jalaram Engineering Works, Akola, Maharashtra
Mini Dal Mill (3 hp)	Shree YMB Agro Tech, Akola, Maharashtra
Mini Dal Mill	Tool Tech Solution, Jalna, Maharashtra

Name of Machine	Manufacturer
Mini Dal Mill	Palak Udyog, Akola, Maharashtra
Mini Dal Mill	Welcome Industries, Amravati, Maharashtra
Seed Grader cum Multi Grain Cleaner	Dwarkamai Engineering Malegaon, Maharashtra
Mini Dal Mill	Pankaj Industries, Akola, Maharashtra
Mini Dal Mill (3 hp)	Shriram Associates, Akola, Maharashtra
Mini Dal Mill (5 hp)	
2-in-1 Flour Mill cum Pulveriser	E-Agro Care Machineries and Equipments Pvt Ltd, Aurangabad, Maharashtra
Mini Rice Mill cum Flour Mill	
Mini Dal Mill (5 hp)	Vishwakarma Engineering Works, Akola, Maharashtra
Mini Dal Mill (3 hp)	
Arecanut Dehusker	V-Tech Engineers, Shivamogga, Karnataka
Rice Mill	
Mini Oil Extractor/ Mill	Surjeet Agricultural Industries, Raipur, Chhattisgarh
Mini Oil Expeller/ Mill	
Mini Dal Mill	
Seed/ Grain Cleaner	New Deogan Agri Works, Barnala, Punjab
Mini Flour Mill (Pulverizer - 3 hp)	
Flour Mill (Pulverizer - 3 hp)	Centrifugal Products, Valsad, Gujarat
Flour Mill (Pulverizer - 5 hp)	
Flour Mill (Pulverizer - 10 hp)	
Seed/ Grain Cleaner/ Grader	Zenith Engineering and Works, Ambala, Haryana
Mutli Grain Cleaner Winnower	Prince Agro Industries, Barnala, Punjab






Food Testing Laboratory (FTL)

The well-equipped Food Testing Laboratory funded by Ministry of Food Processing Industries (MoFPI), New Delhi houses basic and semi-advanced equipment for food analysis and evaluating the safety aspects of food products. This laboratory is catering to the food testing and quality analysis requirements of different stake holders, entrepreneurs in getting their samples tested. Testing protocols for certain parameters like water quality testing, fat, protein and fibre analysis, mineral contents etc. have been validated. This facility has enabled the institute to answer the need-based test requirement of processers, entrepreneurs, small and medium enterprises, and industry at reasonable testing charges. During 2022, the laboratory received 122 commercial samples for testing. The laboratory generated a revenue of Rs. 8.91 lakh through testing and training activities.

NABL Accreditation

The laboratory has submitted the application for NABL accreditation with scope of chemical testing with two groups namely Food & Agricultural Products and Residues in Food Products. The laboratory in the process of NABL accreditation participated in the Proficiency Testing with six other laboratories in the month of November 2022 and achieved a satisfactory Z score in all the three parameters of its participation.

Human Resource Development and Capacity Building Programme

HRD Programme Attended

Scientific Staff	Title of Programme	Organized by	Duration
Dr Nachiket Kotwaliwale	Executive Development Management Programme (EDP) for Leadership Development	ICAR-NAARM, Hyderabad	6
Dr K Narsaiah	Training cum Workshop on Managing Technology Value Chains for Directors & Division Heads	ASCI, Hyderabad	5
Dr Mridula Devi	Training Programme for the Members of Various Technical Committees	BIS, New Delhi	2
	Implementation and Understanding the Importance of Schedule IV General Requirements on Hygiene and Sanitary practices to be Followed by all Food Business Operations	Ministry of Commerce and Industry, GOI, New Delhi	1
	Promotion of Biofortification for Ensuring Nutritional Security	MANAGE, Hyderabad	3
	Linking Farmers to Markets	MANAGE, Hyderabad & PAMETI, Ludhiana	3
Dr D N Yadav	Food Processing - Entrepreneurship Development Programme	Process & Produce Development Centre, Agra	5
Dr Sandeep Mann	Training Programme for Chairperson & Members of Apiary Industry Sectional Committee	BIS, New Delhi	2
	Training cum Workshop on Managing Technology Value Chains for Directors & Division Heads	ASCI, Hyderabad	5
Dr Ranjeet Singh	Food Processing - Entrepreneurship Development Programme	Process & Produce Development Centre, Agra	5
Dr R C Kasana	Online MDP on Leadership Development	ICAR-NAARM, Hyderabad	12
Dr Leena Kumari	Training of Trainers in UAV	ICAR-CIAE, Bhopal	7
	Additive Manufacturing & 3D Printing	IIT, Roorkee	12

Scientific Staff	Title of Programme	Organized by	Duration
Dr Vikas Kumar	Analysis of Experimental Data	ICAR-NAARM, Hyderabad	6
	Uncertainty of Measurement and Decision Rule	Quality Council of India, New Delhi	2
	स्वतंत्रता के 75 वर्ष और राजभाषा हिंदी का विकास विषय पर दो दिवसीय भाषा उत्सव एवं संगोष्ठी	केन्द्रीय पटसन एवं समवार्गीय रेशा अनुसंधान संस्थान, बैरकपुर, कोलकाता	5
Dr Khwairakpam Bembem	Food Processing - Entrepreneurship Development Programme	Process & Produce Development Centre, Agra	5
Dr Renu Balakrishnan	Extension programme planning- A system perspective	ICAR-NAARM, Hyderabad	5
Er Kalnar Yogesh	Preventive Vigilance (OTP-PV)	ISTM, New Delhi	2
Dr Poonam	Biosecurity and Biosafety: Policies, Diagnostics, Phytosanitary Treatments, and Issues	ICAR-NBPGR, New Delhi.	10
Dr Sandeep Popatrao Dawange	Introduction to Artificial Intelligence	ISTM, New Delhi	3
	Food Processing - Entrepreneurship Development Programme	Process & Produce Development Centre, Agra	5
	Advances in Web & Mobile Application Development	ICAR-NAARM, Hyderabad	5
Dr Thingujam Bidyalakshmi Devi	Computer Aided Design	ICAR-CIAE, Bhopal	30
Dr Bhupendra M Ghodki	Management of Digital Hygiene: Staying Secure in Cyber Space	C-DAC, Mohali	5
Dr Guru P N	Competency Enhancement Programme for Effective Implementation of Training Functions by HRD Nodal Officers	ICAR-NAARM, Hyderabad	3
	Training Programme for Chairperson & Members of Apiary Industry Sectional Committee	BIS, New Delhi	2
	Stakeholders Workshop on Grain Storage & Pest Management	CSIR-CFTRI, Mysore	2
Er Shaghaf Kaukab	Management of Digital Hygiene: Staying Secure in Cyber Space	C-DAC, Mohali	5
	MATLAB Programming	MNIT Jaipur, NT Patna & PDPM, IITDM Jabalpur	12
Er Thongam Sunita Devi	Additive Manufacturing & 3D Printing	IIT, Roorkee	12
	MATLAB Programming	MNIT Jaipur, NT Patna & PDPM, IITDM Jabalpur	12
Dr Mahesh Kumar Samota	Training of Trainers in UAV	ICAR-CIAE, Bhopal	7

Technical Staff	Title of Programme	Organized by	Duration
Smt Sonia Rani	Advances in Web & Mobile Application Development	ICAR-NAARM, Hyderabad	5
Sh Gurdeep Singh	Motivation, Positive Thinking & Communication Skill	ICAR-NAARM, Hyderabad	4
Sh Devinder Kumar	Selection Adjustment, Operation & Maintenance of Agricultural Implements for Field & Horticultural Crops	ICAR-CIAE, Bhopal	10
Sh Jaswant Singh	Skill Development Training	SLIET, Longowal	5
Sh Vishal Kumar	Motivation, Positive Thinking & Communication Skill	ICAR-NAARM, Hyderabad	4
	Capacity Building Programme for ICAR-CJSC members	ICAR-NAARM, Hyderabad	5
	FRP Carp Hatchery Operation for Carp Breeding	ICAR-CIFA, Bhubaneswar	3
Dr Rupinder Kaur	Extension Programme planning – A system Perspective	ICAR-NAARM, Hyderabad	5
Sh Lakhwinder Singh	Skill Development Training	SLIET, Longowal	5
Sh Hardeep Singh	Skill Development Training	SLIET, Longowal	5
Sh Jaswinder Singh	Skill Development Training	SLIET, Longowal	5
Sh Bhajan Singh	Skill Development Training	SLIET, Longowal	5
Sh Jagtar Singh	Skill Development Training	SLIET, Longowal	5
Sh Prithvi Raj	Irrigation Systems & Advancements	NIPHM, Hyderabad	3
	Motivation, Positive Thinking & Communication Skill	ICAR-NAARM, Hyderabad	4
Sh Rajesh Kumar	Irrigation Systems & Advancements	NIPHM, Hyderabad	3
Smt Pragya Singh	Microbiological & Biochemical Techniques Used in Industry	ICAR-CIPHET, Ludhiana	10

Administrative Staff	Title of Programme	Organized by	Duration
Sh Kunwar Singh	Communication Skills for Supervisory Officers	ISTM, New Delhi	2
	Pension & Other Retirement Benefits	ICAR-NAARM, Hyderabad	2
Sh Gurdial Singh	Noting & Drafting	ISTM, New Delhi	2
	Preparation of Roster (POR-2)	ISTM, New Delhi	3
Smt Jasvir Kaur	Preparation of Roster (POR-2)	ISTM, New Delhi	3
Sh Rajinder Kumar Raheja	Training programme on GeM-01	ISTM, New Delhi	2
	MS-Excel (MS-Ex-10)	ISTM, New Delhi	3
Sh Ajay Kumar	Noting & Drafting	ISTM, New Delhi	2
	Training programme on GeM-01	ISTM, New Delhi	2
	MS-Excel (MS-Ex-10)	ISTM, New Delhi	3

HRD Programme Organized

Programme Title	Number of Participants	Duration
Winter School		
Innovative Storage Solutions: The Best Way Forward for Reducing Post-Harvest Losses, and Doubling Farmers' Income	21	18 Nov- 8 Dec 2022
Capacity Building Programme		
Agricultural Extension Professionals of ATARI Zone-I on Post-Harvest Technologies	12	23 – 25 May 2022
Agricultural Extension Professionals of ATARI Zone-II on Post-Harvest Technologies	16	2 – 4 Aug 2022
High End Workshop Sponsored by SERB		
Hands-on Training on High-End Scientific Equipment for Appraisement of Food Properties	25	1-10 Nov 2022
MANAGE Sponsored Collaborative Training		
Value Chain Management of Agricultural Commodities for Income Enhancement of Stakeholders (Online mode)	18	4-6 May 2022
Entrepreneurship Development Programme (EDP)		
Fermentation Technology	1	21 Jan - 4 Feb 2022
PHM-Cold Room, Cold Storage, Ripening Chamber and Reefer-van for Horticulture Entrepreneurs	15	19-24 Sep 2022
Farmers Training		
Processing and Value Addition of Makhana	170	6-7 Sep 2022
ATMA Sponsored Farmers Training		
Post-Harvest Technology for Agricultural Produce	20	13-17 Sep 2022
Post-Harvest Technology for Agricultural Produce	15	21-25 Nov 2022
Post-Harvest Processing of Makhana and Other Crops of North Bihar	15	5-9 Dec 2022
Farmer's FIRST Project		
Honey Processing and Packaging	1	3-5 Jan 2022
Honey Processing and Packaging	1	22 Jul 2022
Wadi Processing	1	09 May 2022
On Farm Handling and Packaging of Horticultural Produce	41	27 Dec 2022
Student's Training		
B. Tech. (Agril Engg) College of Agricultural Engineering & Technology, CCSHAU, Hisar, Haryana	8	14 Mar -13 Apr 2022
M. Tech. (Agril Engg) students from Chandra Shekhar Azad University & Technology, Kanpur, Uttar Pradesh	3	05 Apr -13 May 2022
B.Tech. (Biotechnology) students from College of Animal Biotechnology, Guru Angad Dev Veterinary and Animal Science University, Ludhiana, Punjab	5	18 Apr - 28 May 2022
B. Tech. (Agricultural Engineering) students from 13 colleges	54	1-30 Jun 2022
NAHEP funded Training on Farm Mechanization for Post-Harvest Operations for B Sc and B. Tech. students of Acharya N.G. Ranga Agricultural University (ANGRAU), Guntur, Andhra Pradesh	30	1-31 Jul 2022
College of Agricultural Engineering & Technology, Punjab Agricultural University, Ludhiana, Punjab	33	08 Aug - 06 Oct 2022

Winter School on Innovation Storage Solutions

Capacity Building Training Programme

EDP on PHM-Cold Storage

High end workshop sponsored by SERB

ATMA sponsored farmers training

Training under Farmer FIRST Project

Student's training programme

Specialized training on food testing and quality analysis of forest produce

Specialized Trainings

Title	Contracting party	Duration
Assessment of Fruit Quality using Biochemical and Non-destructive Methods	Zentron Pvt. Ltd., Bangalore	09 -11 Feb 2022
Fabrication and Manufacturing of Live Fish Carrier System	JJ Fish, Farrakka, West Bengal	24 Mar 2022
Food Testing and Quality Analysis of Forest Produce	Chhattisgarh State Minor-Forest Produce Federation (CGMFP)	7-18 Oct 2022

Extension Activities

Industry Interface Fair on Agro processing – 2022 (CIPHET-IIFA 2022)

ICAR-CIPHET on its foundation day organized ICAR-CIPHET- Industry Interface Fair on Agro-processing (IIFA) & Kisan Mela (KM)– 2022. Nearly 1500 stakeholders like farmers/ students/ entrepreneurs were attended this event. As an attraction many stalls on agro-processing from the research institutes, industries and start-ups have displayed and demonstrated their technologies. A meeting was also held as a part of the meet for Creation of Processing Equipment Manufacturing Association (PEMA). The meeting was Chaired by Director, ICAR-CIPHET and attended by 55 online and offline participants/manufacturers/researchers. The aim of PEMA is to provide a platform for technical co-ordination, management, advisory, discussion and liaison with the Government Organizations. The initially selected members of the association comprise of manufacturers of process equipment/machinery.






Stakeholders Meet

ICAR-CIPHET, Ludhiana organized the 'Stakeholders Meet on *Makhana*' on 5 September 2022 at ICAR-Research Centre for *Makhana*, Darbhanga, Bihar in collaboration with ICAR-Research Complex for Eastern Region, Patna. More than 175 *makhana* farmers/ entreprenurs/ members of FPOs & SHGs from Darbhanga and Madhibani districts, Bihar. Various officers from Department of Agriculture, Government of Bihar, Dr S.N. Jha, DDG (Agril Engg.), ICAR, New Delhi; Shri Rajeev Raushan (IAS), District Magistrate, Darbhanga; Dr. M.S. Kundu, Director, Extension Education, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur; Dr. Vidyanath Jha, Retired Professor (Botony), Lalit Narayan Mithila University, Darbhanga; Dr. Sadanand Patel, Professor & Ex-Dean, IGKV Raipur; Dr. Ashutosh Upadhyay, Director (Acting), ICAR-Research Complex for Eastern Region, Patna; Director, ICAR-CIPHET, Ludhiana participated in this programme.

Farmer Interest Group

A Farmer interest group of 20 beekeepers from Dhuri, Sangrur was created under the Farmer FIRST Project. They were trained on modern method of honey processing and packaging through semi-automatic honey processing unit. To increase scale of honey production, 225 honeybee boxes were distributed to 20 beekeepers of farmer interest group on 20 October 2022.

Farmer-Scientist Interface Meeting

A Farmer-scientist interface meeting on “Honey processing and packaging” was conducted at KVK, Bathinda on 22 December 2022 with 34 beekeepers of Bathinda, Punjab under the Farmer FIRST Project, ICAR-CIPHET, Ludhiana. Dr. Sandeep Mann, Dr. Rahul K. Anurag, Dr. Renu Balakrishnan and other project team members discussed with progressive beekeepers on modern honey processing and packaging. The team guided and motivated the beekeepers for processing of honey with modern honey processing plant, moisture reduction as per FSSAI, AGMARK and BIS standards, packaging, labelling and brand development. The team also elaborated some aspects on honey quality parameters, FSSAI registration process, marketing strategies to enhance the sale of packaged honey at retail level. The team also encouraged the farmers to establish small scale honey processing unit on a custom hiring basis. The farmers were guided to sell honey in retail and direct marketing rather than selling to traders in bulk quantity. The farmers were also provided with the bee keeping kits under the project.

Outreach Programmes

Programme Title	Venue	Number of Participants	Duration
Awareness training programme for women SHGs/Entrepreneur/FPOs was organized under the project “Mechanized System for making Hawaijar-A traditional fermented food of North-East India funded by DSIR, New Delhi	Kaching and Imphal West, Manipur	87	7-9 Mar 2022
Awareness training programme for women SHGs/Entrepreneur/FPOs was organized under the project “Mechanized System for making Hawaijar-A traditional fermented food of North-East India” funded by DSIR, New Delhi	Imphal East and Thoubal, Manipur	240	24 -26 Aug 2022
“Users’ awareness workshop” on “Vision Guided AI enabled Robotic Apple Harvester” funded by Meity and jointly organized with SKUAST-Kashmir, C-DAC Kolkata and IIT-Kharagpur	SKUAST-Kashmir	60	19 Oct 2022

- Farmer FIRST Team, ICAR-CIPHET visited Agro-processing centers (Pabla Brothers and Padan *Atta Chakki*) established at Rahon, Punjab to monitor the working of units under the project. The team discussed with farmers linked with the units regarding the processing of turmeric, wheat, maize, pulses and other spices. They were also guided on FSSAI registration, retail packaging and brand development. The team also visited established honey processing unit at Rahon, Punjab and discussed with farmer about bee keeping practices, migration of bee boxes, honey packaging, moisture reduction, quality composition and standards, FSSAI license etc.

- Farmer FIRST Team, ICAR-CIPHET visited the Agro-processing centre established at Khalsa Farm, Balachour, Punjab under the project on 20 August 2022 for monitoring the working of the unit. The team also visited bee farm of Mr. Deepak Sunda (beekeeper) at Banga, SBS Nagar and discussed about honey processing, adopted migration practices, packaging and marketing of processed honey.

- Farmer FIRST Team, ICAR-CIPHET visited the Agro-processing centre Padan *Atta Chakki* established at Dharmkot and Honey processing unit, Rahon, Punjab under the project on 8 December 2022 for providing technical guidance and evaluating the progress of the units.

- Farmer First Project Team, ICAR-CIPHET, bee farmers of Dhuri, Sangrur, Punjab on 8 September 2022. They were guided about processing and packaging of honey. They were advised to sell their processed honey in retail market with proper packaging instead of selling raw honey in bulk to traders and wholesalers. They were also guided about FSSAI registration, brand development and quality testing of final products.

- Farmer FIRST Team, ICAR-CIPHET visited some traditional jaggery producing unit in Rahon, Punjab on 08 December 2022. Entrepreneurs were made aware about chemical free jaggery production methodologies, market demand, production of cube and candy shaped jaggery, jaggery production using improved 3-pan furnace heating system, packaging, labelling and FSSAI registration.

Participation in Exhibitions/Melas

Programme Title	Venue	Duration
AgriTech & Food Tech, Tech Bharat 2022 (Edition-III)	CSIR-CFTRI, Mysore, Karnataka	19-21 May 2022
Mela as a part of '*Garib Kalyan Sammelan*' programme	IIMR, Punjab	31 May 2022
Kisan Mela	PAU, Punjab	23-24 Sep 2022
CII Agro Tech India 2022	Chandigarh	4-7 Nov 2022

Demonstrations

- Chemical free jaggery production unit and honey processing unit was demonstrated to farmers on 5 January 2022 at Nawanshahar, Punjab

- Demonstration of the developed automatic sorting/grading machine for tomato/ pomegranate and oxygen concentrator in front of Research Advisory Committee (RAC) members of the Institute on 10 March 2022

Schedule Caste Sub Plan (SCSP)

ICAR-CIPHET is implementing SCSP scheme with the main objective to improve the socio-economic conditions of the SC community. Under this scheme, various training/capacity building programmes are being organized for scheduled caste farmer, farm women and youths to enhance the incomes of the target group through processing of agricultural produce. During this period, eleven programmes were organized in seven states for the benefit of SC community.

Programme Title	Venue	Number of Participants	Duration
Post-Harvest Management of Agricultural Produce	Saurath Village, Madhubani, Bihar	44	7-9 Feb 2022
Post-Harvest Management of Agricultural Produce	Bihari Haldi Foods Pvt. Ltd, Surhachatti, Darbhanga, Bihar	46	10-12 Feb 2022
Processing and Value Addition of Food Grains	ICAR-CIPHET, Ludhiana, Punjab	54	24-26 Feb 2022
Safe Handling and Storage of Food Commodities	Integrated Bio-Centre, Department of Horticulture, Mysuru, Karnataka	55	3-5 Mar 2022
Processing and Value Addition of Horticultural Crops of Manipur	CAU, Imphal, Manipur	50	11-15 Mar2022
Processing and Value Addition of Horticultural Crops of Kerala	KAU, Thiruvanthapuram, Kerala	55	15-17 Mar 2022
Processing and Value Addition of Onion, Garlic and Chilli	KVK, Fatehpur, Sikar, Rajasthan	50	16-18 Aug 2022
Processing and Value Addition of Cereals, Millets and Pulses	ICAR-CIPHET, Ludhiana, Punjab	50	29-31 Aug 2022
Post-Harvest Management and Processing of Fruits and Vegetables of Temperate Zone of Himachal Pradesh	Department of Horticulture, Mandi, Himachal Pradesh	50	12-14 Sep 2022
Post-Harvest Processing and Value Addition of Fruits and Vegetables	She Haat SHG, Sirmour, Himachal Pradesh	50	15-17 Sep 2022
Post-Harvest Processing and Value Addition of Fruits and Vegetables	YS Parmar UHE (RHRS), Kangra, Himachal Pradesh	50	19-21 Sep 2022


अनुसूचित जाति उप-योजना के अंतर्गत
द्वारा आयोजित कौशल विकास प्रशिक्षण


Training on
"Processing and Value Addition of Horticultural Crops of Kerala"
under
Scheduled Caste Sub Plan (SCSP)
15-17 March 2022


Safe Handling and Storage of Food Commodities

Visitors

Officials

Address of Visitors	Number of Visitors	Date
Dr V P Chahal, ADG (Agril Extension) Dr Rajbir Singh, Director, ICAR-ATARI, Zone-I, Ludhiana visited APCs established under FFP project	2	21 Jan 2022
Delegates of Government of Nepal	28	15 Mar 2022
Dr S N Jha, DDG (Agril Engineering)	1	19-20 Apr 2022
Sh Sanjib Choudhury, Deputy Director of Fisheries, Govt. of Assam Dr Dhrubajyoti Sharma, SDFDO, Nodal Officer APART (Fisheries), World Bank Project Sh Trailokya Saloi, District Fishery Development Officer (Nalbari), Govt of Assam Sh Bhaskar Jyoti Nath, District Fishery Development Officer (Marigaon), Govt of Assam	4	10-11 Jun 2022
Sh Raghunath B, Chief General Manager (CGM), NABARD, Chandigarh	1	18 Jul 2022
Dr R K Pruthi, Director Horticulture, Himachal Pradesh	1	18 Jul 2022
Sh Fauja Singh Sarari, Minister for Horticulture and Food Processing, Govt of Punjab Sh K A P Sinha, Additional Chief Secretary, Govt of Punjab Sh Rajnish Tuli, MD, Punjab Agro Industries Corporation Limited	3	9 Aug 2022
Dr S K Chaudhari, DDG (NRM)	1	18 Aug 2022

Farmers

Address of Visitors	Number of Visitors	Date
Directorate of Horticulture, Sabarkantha District, Gujarat	53	01 Jan 2022
NABARD & Samaj Kalyan Avam Samnvit Vikas Sanstha (SWIDS), Hanumangarh	25	13 Sep 2022
Deuty Director Agriculture & Project Director, ATMA, Nagaur District, Rajasthan	45	17 Nov 2022
Farmers from Yamunanagar, Haryana	15	30 Nov 2022

Student's Educational Visits

Address of Visitors	Number of Visitors	Date
MSc. (Agril. Extension) students, PAU, Ludhiana, Punjab	13	21 Apr 2022
Lovely Professional University, Jalandhar, Punjab	69	9 May 2022
College of Agriculture, KAU, Ambalavayal, Kerala	64	13 May 2022
University of Agricultural Sciences, Shimoga, Karnataka	89	27 May 2022
College of Agriculture, Lovely Professional University, Jalandhar, Punjab	70	13 Jul 2022
Govt Polytechnic College for Girls, Ludhiana, Punjab	23	14 Jul 2022
Kelappaji College of Agriculture Engineering and Technology, KAU, Malappuram, Kerala	51	8 Dec 2022

Events Organized

Republic Day Celebration

ICAR-CIPHET celebrated 73rd Republic Day to honour the date on which the Constitution of India came into effect. On this occasion Dr. Nachiket Kotwaliwale, Director, ICAR-CIPHET, hoisted the tricolour and addressed the staff of the institute. Different cultural and sports activities were organized for staff and their family members after the flag hoisting ceremony.

International Women's Day Celebration

ICAR-CIPHET celebrated International Women's Day (IWD) on 8 March 2022. This year theme of ICAR was "Gender equality today for a sustainable tomorrow".The Women Cell of the Institute organized the event and was attended by all the staff and women members of residential campus . To commemorate the occasion and celebrate the theme, two successful women entrepreneurs, who were trained by the Institute, were were invited to share their experiences and honoured. Dr. Nachiket Kotwaliwale, Director, ICAR-CIPHET, Ludhiana congratulated all the women workforce engaged in technology development, dissemination and commercial exploitation. He assured continued support of the Institute for such endeavors. KVK, Fazilka also felicitated 20 women farmers during the occasion.

World Water Day-2022

AICRP on Plastic Engineering in Agricultural Structures and Environment Management (PEASEM), ICAR-CIPHET, Ludhiana celebrated “World Water Day” on theme “Groundwater: Making the Invisible Visible” on 22 March 2022. A total of 8 students from CCSHAU, Hisar and 15 farmers from Ludhiana attended this program. On this occasion, Director of ICAR-CIPHET, Dr. Nachiket Kotwaliwale, briefed the farmers and students about the importance of water and the immediate need to conserve it for future generations and assured the farmers for any technical guidance from CIPHET for post-harvest processing and value addition, storage techniques and protected cultivation. Following, Dr. R. K. Singh, Project Coordinator (PEASEM), ICAR-CIPHET, Ludhiana sensitized the farmers about the technologies for rainwater harvesting, lining of water harvesting tank to control seepage of harvested water, micro irrigation/drip irrigation and protected cultivation via a presentation on the proposed theme. Dr. Singh emphasized on groundwater recharge and use of efficient irrigation systems to save water and spread the message of “Grow More with Less”. The on-farm water harvesting, pond lining, mulching, drip irrigation, crop cultivation under low tunnels and polyhouse technologies in the Plasticulture Park were demonstrated and explained to the attendees.

International Day of Yoga-2022

The institute celebrated 8th International Day of Yoga on 21 June 2022 at both campuses (Ludhiana and Abohar). It proved to be a successful event with a great number of participants, around more than 100, including the staff, their family members, students, and farmers. This year's programme was themed at "Yoga for humanity". The programme was conducted in the morning and a renowned Yoga Guru from *Bharatiya Yog Sansthaan*, Ludhiana, Mrs. Priyanka Sharma demonstrated different *aasanas* and explained their health benefits as well as the precautions to be taken.

Har Ghar Tiranga

National Flag was hoisted by every staff member from 13-15 August 2022 to celebrate 'Har Ghar Tiranga' campaign to commemorate the 75th Independence Day. On this occasion our national flag was distributed to every staff member of the institute.

Independence Day Celebration

The institute celebrated 75th Independence Day at both campuses on 15 August 2022. Dr. Nachiket Kotwaliwale, Director, ICAR-CIPHET unfurled the Tricolour in Ludhiana campus and addressed the staff on the occasion. He highlighted the achievements of the Institute during this year and stressed upon the importance of post-harvest management along with maintaining health and hygiene.

Vigilance Awareness Week

ICAR-CIPHET, Ludhiana and Abohar Campus observed the Vigilance Awareness Week and organized different activities during 31 Oct- 6 November 2022. The week started with the pledge taking ceremony by Dr. Nachiket Kotwaliwale, Director, all the Scientific, Technical and Administrative staff of the Institute. An invited lecture on "Corruption-free India for a developed nation" by Sh Raj Kumar Bajaarh ACP, Economic Offence and Cyber Crime, Ludhiana was also organized. Different awareness programs were conducted at Abohar and surrounding villages during the week. KVK Abohor organized a Gram Sabha at village Jodhpur to create awareness among rural people and 22 farmers attended the programme.

Communal Harmony Campaign

ICAR-CIPHET observed Communal Harmony Campaign week during 19-25 November 2022 and Flag Day on 25 November 2022. Flag Day spread the message of Communal Harmony and National Integration to the people of the country utilized for fund raising to enhance resources of the Foundation. On Flag Day, flags were distributed to employees of the institute and encouraged them to donate generously.




World Soil Day

AICRP on PEASEM, ICAR-CIPHET, Ludhiana celebrated World Soil Day on 5 December 2022 at village Dhak Majra along with its cooperating centre in Dept of Soil &Water Engineering, PAU Ludhiana. This day signifies the importance of soil in our ecosystem i.e. where food begins. A series of lectures were delivered by experts on maintaining health and enhancing productivity of soil. Dr Angrej Singh, Associate Professor, COAET, PAU, Ludhiana enlightened farmers about importance of soil health and proper treatment to be undertaken to maintain the soil health. Dr Rakesh Sharda, PI, AICRP on PEASEM, PAU briefed about shortage of nutrients in soil and water and how to fulfil the required nutrients of soil for crop production. He also highlighted on saving of water through use of drip irrigation. Healthy soil will lead to healthy

plants, healthy food and in turn to healthy humans. Dr. Jugraj Singh, Associate Professor briefed about the need for and importance of celebration of world soil day and soil health card. Dr. Nachiket Kotwaliwale, Director, ICAR CIPHET highlighted about the use of proper nutrition and fertilizers to save soil for a healthy future and on post-harvest management and value addition of agricultural commodities. Dr. Sanjiv Kataria, I/c KVK Noor Mahal, Dr. Gurmeet Singh Agriculture Officer, Phillaur were also present during the occasion. About 80 participants which includes farmers, staffs from ICAR-CIPHET, Scientist from PAU and KVK Noor Mahal attended the programme.KVK, Fazilka also organized programme about importance of soil health card, balanced use of fertilizers, organic farming, importance of soil micro-organisms and soil productivity on the occasion and 26 participants attended the programme.

Swachh Bharat Abhiyan

The *Swachh Bharat Abhiyan* activities during the reporting period were actively conducted under the council's directives. Throughout the year, initiatives including a cleanliness drive, awareness campaigns, digitalization of office documents, weeding out of files, disposal of outdated materials, campus beautification initiatives, and the hanging of banners emphasising the significance of *Swachchhta* were conducted.

Swachchhta Pakhwada 2022

Swachhata Pakhwada cleanliness campaign was organized at ICAR- Central Institute of Post-harvest Engineering and Technology, Ludhiana and Abohar campus during 16 to 31 December 2022. *Swachhata* pledge was taken by all the employees of the institute. All the employees were grouped into different teams for coordinating various activities and sensitizing the society about the importance of *swachhata*. Dr. Nachiket Kotwaliwale, Director, ICAR-CIPHET, Ludhiana, highlighted the relevance of *swachhata* in daily life and the necessity of everyone's participation in this *pakhwada*.

A webinar was organized about the "Post-harvest management of winter crops" as part of '*Swacchata Pakhwada*', on *Kisan Diwas*. Dr. Rupender Kaur, SMS KVK, Abohar has given a brief presentation on post- harvest management of winter crops, where she highlighted the different practices and technologies which helps to add value to the winter crops. The programme was attended by sixty-eight participants included different stakeholders.

The team of ICAR-CIPHET employees also visited different villages in Ludhiana and Abohar and conducted cleaning programmes. This involved cleaning and collecting of garbage and segregating them into biodegradable and non-biodegradable followed by properly disposal, cleaning of sewerage and water lines, creating awareness on recycling of wastewater and water harvesting for using in agriculture/ horticulture/kitchen gardens in residential colonies. During the campaign, various stakeholders were sensitized about reducing wastage of food materials and various techniques for converting waste to wealth. They were also made aware about the importance for discontinuing use of single use plastic and overall cleanliness.




Azadi Ka Amrit Mahotsav

Azadi Ka Amrit Mahotsav is an initiative of the Government of India to celebrate and commemorate 75 years of progressive India and the glorious history of its people, culture and achievements. The official journey of "*Azadi ka Amrit Mahotsav*" commenced on 12 March 2021 which started 75-week countdown to our 75th anniversary of Independence and will end post a year on 15 August 2023. In commemoration of this theme, ICAR- Central Institute of Post-Harvest Engineering & Technology, Ludhiana commenced various programmes, webinars, webinar series, orientation programme, EDPs etc. Some of the highlights are:

Webinar Series

National Webinar on 'Bioactive Peptide from Fish Waste'

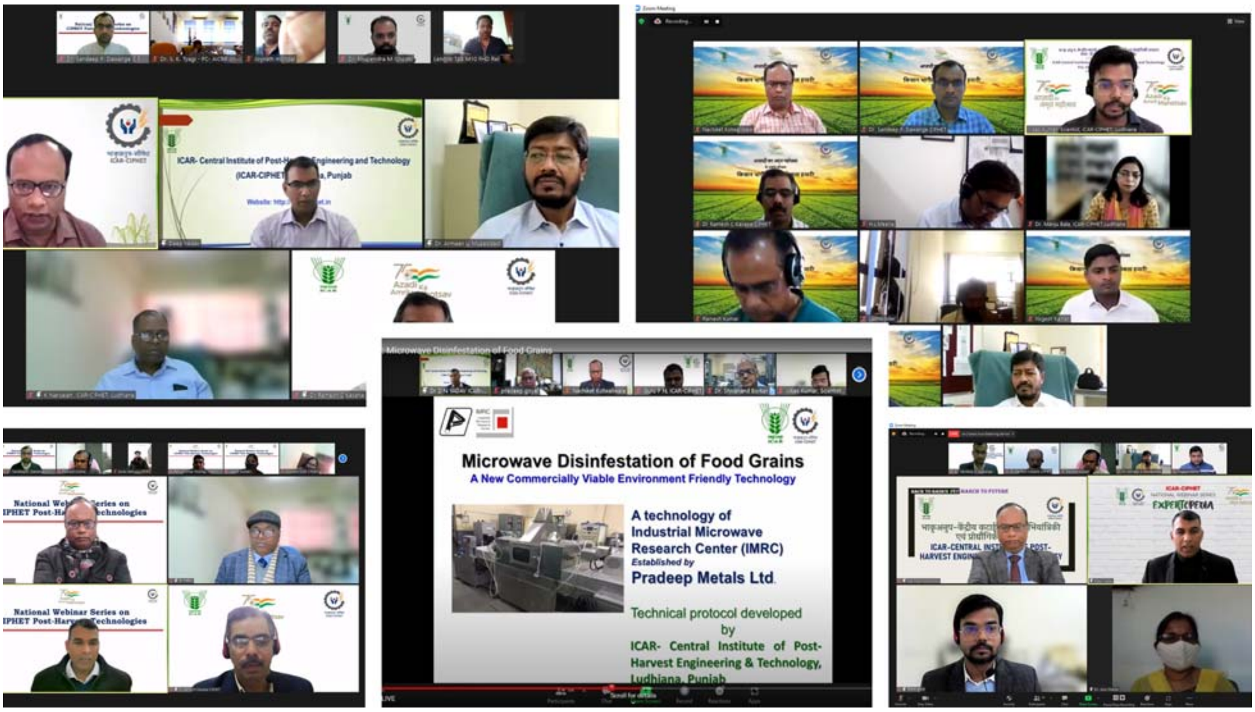
In its Knowledge Series Webinar-FishTalk, on 10 January 2022 first talk was delivered on 'Fish collagen peptides and their anti-osteoporotic properties' by Dr. Robinson Jeya Shakila, Professor and Head, Department of Fish Quality Assurance & Management, TNJFU, Thoothukudi and second talk on 'Anti-hypertensive peptides from fish processing waste' by Dr. Vikas Kumar, Scientist, ICAR-CIPHET, Ludhiana. Both the experts highlighted the potential of waste utilization in extraction of bioactive (anti- osteoporotic and anti-hypertensive) peptides, showed the way of extraction, briefed about market potential, and put forward future thrust area of research and entrepreneurship. With registrations received from participants of 10 different countries, more than 100 participants participated and interacted enthusiastically.

National Webinar on 'Microencapsulation of Nutraceuticals'

Dr. K. Narsaiah, Head, Agricultural Structures & Environment Control Division delivered the talk and elaborated the use of microencapsulation for preserving potency of heat sensitive nutraceuticals compounds found in spices and different food material. 'Curcumin found in turmeric, garlic oil, fish oil etc. can be encapsulated using the futuristic technique developed by the Institute. This technology will help in reducing the cost, handling issues, and increase the efficacy of delivery system for high value food-based nutraceuticals compounds said the speaker. Microencapsules are useful for preparation of fortified processed foods such as bakery products and dairy based desserts. The webinar was attended by 120 registered participants that includes scientists and professors from ICAR institutes and State Agriculture Universities, students, entrepreneurs, farmers and unemployed youth from different parts of the country.

National Webinar on 'Microwave Disinfestation of Food Grains'

The webinar on 23 February 2022 was based on the successful technology developed in ICAR-Industry collaborative efforts of ICAR-CIPHET and Industrial Microwave Research Centre (IMRC) of Pradeep Metals Ltd., Navi Mumbai. The talk was delivered by Dr D N Yadav, Principal Scientist, ICAR-CIPHET and Dr S A Borkar, Industrial Microwave Research Center (IMRC). IMRC of M/s. Pradeep Metals Ltd., in association with ICAR-CIPHET has established a semi-commercial continuous microwave system for disinfestation of the food grains. ICAR-CIPHET, Ludhiana has



standardized the process protocol for treatment of the food grains like rice (basmati and non-basmati) and wheat. The joint study indicated that microwaves can be used as an instant and environment friendly pre-treatment process for disinfestation of the food grains before packaging, storage and transportation. The study indicated that microwave treated grains can be stored without infestation for at least 12 months, if cross infestation is avoided. Mr. Pradeep Goyal, Founder and CMD of Pradeep Metals Ltd., Navi Mumbai briefed the role of industry in technology development, application of continuous microwave system and its economical feasibility. The webinar was attended by around 100 participants that includes rice millers, grain (cereal and pulses) millers, industrialists, start-ups, scientists, and budding entrepreneurs from different parts of the country.

National Webinar on 'Live Fish Carrier System and Fish Cleaning Station: Promising Technology'

ICAR-CIPHET organized the webinar on 11 April 2022 to discuss and demonstrate the 'Live Fish Carrier System (LFCS) and Fish Cleaning Station' developed by the Institute.Dr. Armaan U. Muzaddadi, Principal Scientist and Inventor of the technologies stressed on the need of safe transport and processing facilities for the highly perishable commodities like fish. LFCS is equipped with the aeration system, continuous water filters and ammonia absorption system at the bottom. The e-Rickshaw based LFCS is capable of transporting about 100 kg live fish upto the distance of 40 km with controlled water splash system that gives stability to the vehicle. The institute's 'Fish Cleaning Station' can be effectively used to maintain the utmost hygienic conditions during the dressing of fish in the local markets and fish sale points. The webinar was attended by more than 90 participants.

Online Certificate Course on Microbiological and Biochemical Techniques Used in Industries

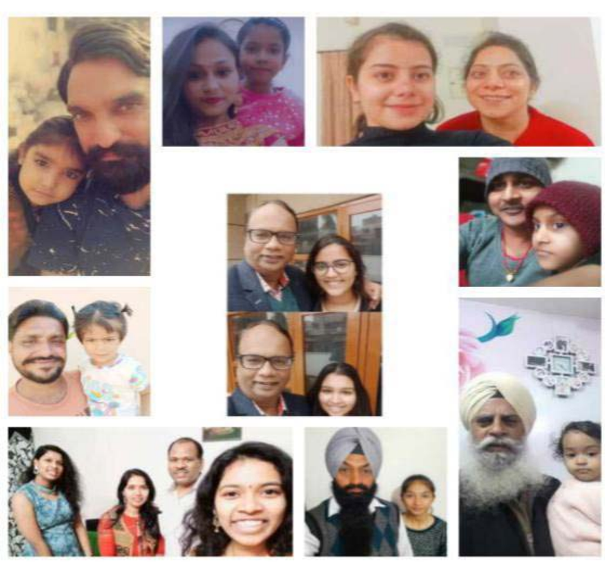
To celebrate *Azadi Ka Amrit Mahotsav*, ICAR-CIPHET, Ludhiana conducted a 10-days Online Certificate Course on Microbiological and Biochemical Techniques in Industries, during 11-20 January 2022. The training was attended by 25 participants from different states of India.

'किसान भागीदारी, प्राथमिकता हमारी' अभियान के दौरान हिंदी में वेबिनार

देश की आजादी का अमृत महोत्सव के तहत भाकृअनुप–सीफेट, लुधियाना ने 'किसान भागीदारी, प्राथमिकता हमारी' अभियान के दौरान 28 अप्रैल 2022 को एक वेबिनार का आयोजन किया। अमृत महोत्सव की कड़ी में अधिकाधिक जनभागीदारी के लिए संस्थान द्वारा विकसित प्रोद्योगिकी के बारे में हिंदी में प्रस्तुतीकरण का प्रयास किया जा रहा है। राजभाषा हिंदी की तिमाही कार्यशाला (ऑनलाइन) में राजभाषा विभाग द्वारा विकसित 'कंठस्थ', 'बायोफोर्टिफाइड मक्काः भारत की पोषण सुरक्षा की दिशा में एक कदम' और 'ग्लूटेन–मुक्त बेक्ड उत्पाद' विषयों पर विशेषज्ञों ने चर्चा की। राजभाषा विभाग द्वारा विकसित अनुवाद टूल, 'कंठस्थ' पर बनी लघु चलचित्र भी प्रतिभागियों को दिखाया गया। डॉ. नचिकेत कोतवालीवाले, निदेशक, भाकृअनुप–सीफेट, लुधियाना ने संस्थान की तकनीकी उपलब्धियों के बारे में वेबिनार के प्रतिभागी को अवगत कराया। उन्होंने कहा कि भाकृअनुप–सीफेट नियमित अंतराल पर आयोजित उद्यमिता विकास कार्यक्रम के माध्यम से उद्यमियों को प्रशिक्षण प्रदान करता है। उन्होंने समाज के समग्र विकास के लिए शिक्षित युवाओं में उद्यमिता को बढ़ावा देने की आवश्यकता पर बल दिया। देश के विभिन्न हिस्सों से वैज्ञानिकों, शिक्षाविदों, छात्रों, उद्यमियों और किसानों सहित लगभग 100 पंजीकृत प्रतिभागियों ने वेबिनार में उत्साह पूर्वक भाग लिया।

National Girl Child Day

ICAR-CIPHET, Ludhiana celebrated 'National Girl Child Day' on 24 January 2021 under '*Azadi ka Amrut Mahotsav*'. The COVID protocol although hampered any programme with gathering, but could not stop the enthusiasm of the proud parents of girl child in the institute who expressed their emotions via their selfies with their daughters. The young female achievers of the Institute were also felicitated for their commendable work in academics, sports, writing etc. The institute staff also attended the online Lecture on '*Beti Bachao Beti Padhao*: Not a slogan but a war cry to make India developed' delivered by Mrs. Rekha Sharma, the Chairperson of National Commission for Women organized by ICAR-Indian Institute of Maize Research, Ludhiana. A virtual program was conducted at KVK, ICAR-CIPHET, Abohar. In this online program Govt. schemes for girls were discussed to create awareness among the participants. Total 23 participants joined the event.



Workshop on Millets based Food Products

A one-day workshop on 'Millets based Food Products' was organized at ICAR-CIPHET, Ludhiana campus on 20 April 2023 for Anganwadi Workers as a part of '*Annadata Devo Bhava*' campaign under *Azadi Ka Amrit Mahotsav*. About 50 anganwadi workers of Sudhar block of Ludhiana District participated in this workshop. The workshop comprised of hands-on training for preparation of millets based baked, extruded, popped, and weaning foods.

Azadi Ke 75 Saal, Fitness Rahe Bemisaal with Yoga Program

ICAR-CIPHET, Ludhiana organized a *yoga* program on 18 October 2022 under *Azadi ka Amrit Mahotsav* with theme *Azadi Ke 75 saal, fitness rahe bemisaal*. On this occasion Mr. Shiv Kumar Sharma, *Yoga* Expert, Jyoti Kendra Hospital Ludhiana addressed the participants and explained the various asanas and highlighted the importance of yoga in human life for holistic development. More than 70 participants performed various yoga asana at the playground of the institute on this occasion. Dr. Nachiket Kotwaliwale Director, ICAR-CIPHET, elucidated the urgent need to adopt good food habits and *yoga* in our day-to-day life for healthy mind and body. All the staff and CIPHET campus members actively participated and performed various yoga asanas.

हिन्दी पखवाड़ा/कार्यशाला

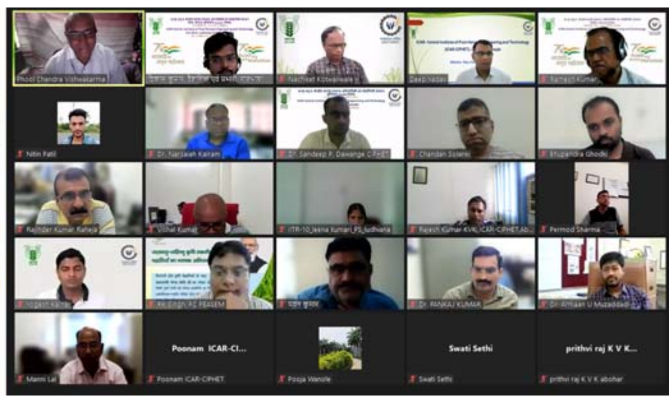
राजभाषा हिन्दी पखवाड़ा

प्रत्येक वर्ष की भांति, संस्थान में इस वर्ष दिनांक 14 से 28 सितम्बर 2022 तक राजभाषा हिन्दी पखवाडा मनाया गया। समारोह का उद्घाटन दिनांक 14 सितम्बर 2022 को डा. नचिकेत कोतवालीवाले, माननीय निदेशक, भा.कृ.अनु.प.–सीफेट, लुधियाना के कर कमलों द्वारा किया गया। इस अवसर पर वैज्ञानिक एवं स्टाफ सदस्यों को सम्बोधित करते हुए उन्होने हिन्दी के प्रचार–प्रसार के लिए दिनचर्या में सरल शब्दों के प्रयोग पर जोर दिया। भा.कृ.अनु.प.–सीफेट, लुधियाना मे वैज्ञानिक एवं प्रशासनिक कार्यो में हो रहे हिन्दी के उपयोग की मुख्य अतिथि ने सराहना की एवं प्रतियोगिताओं में बढ़–चढ़ कर भाग लेने का आह्वान किया। राजभाषा हिंदी पखवाड़ा के अध्यक्ष डॉ. आर.के. सिंह ने अपने संबोधन में बताया कि हिन्दी पखवाड़े को त्यौहार के रूप में मनाने से हिन्दी सशक्त एवं सामर्थ्यवान होगी और उन्होने संस्थान के समस्त वैज्ञानिकों से अनुरोध किया कि वे अपने शोध–पत्रों को हिन्दी भाषा में प्रकाशित करने पर जोर दें।

राजभषा हिन्दी पखवाड़ा के दौरान दोनों परिसरों को मिलाकर कुल 16 प्रतियोगिताएं विभिन्न संयोजकों एवं सह–संयोजकों के सहयोग से करवाई गई, जिनमें 4 प्रतियोगिताएं भाकृअनुप–सीफेट लुधियाना एवं अबोहर में संयुक्त रूप से करवाई गई। राजभाषा हिन्दी पखवाडा के अन्तर्गत आयोजित सभी प्रतियोगिताओं में संस्थान के सभी अधिकारियों एवं कर्मचारियों ने बढ़–चढ़कर हिस्सा लिया। दिनांक 28 सितम्बर 2022 को डा. नचिकेत कोतवालीवाले, सीफेट, लुधियाना द्वारा प्रतियोगिताओं के विजेताओं के पुरस्कार प्रदान

किये गये। इसके अतिरिक्त संस्थान में हिन्दी में किये गये कार्यों का मूल्यांकन कर संस्थान के कर्मचारियों को भी पुरस्कृत किया गया एवं अधिक से अधिक हिन्दी में कार्य करने के लिए सभी को प्रोत्साहित किया गया।

तिमाही	हिंदी कार्यशाला की तिथि	आमंत्रित वक्ता का नाम	आमंत्रित वक्ता के वक्तव्य एवं पदनाम का विषय
अप्रैल–जून 2022	28.04.2022	डॉ. रमेश कुमार प्रधान वैज्ञानिक भा.कृ.अनु.प.–भारतीय मक्का अनुसंधान संस्थान, लुधियाना	बायोफोर्टिफाइड मक्काः भारत की पोषण सुरक्षा की दिशा में एक कदम
जुलाई–सितम्बर 2022	23.07.2022	श्री फूल चन्द्र विश्वकर्मा प्राचार्य, केन्द्रीय विद्यालय, लुधियाना	प्राचीन महापुरुषों के कृषि के संबंध में विचार
अक्टूबर–दिसम्बर 2022	28.10.2022	श्रीमती कुलदीप मक्कड़, पूर्व प्रबंधक, ओरिएण्टल बैंक ऑफ कॉमर्स, लुधियाना	हिंदी (गद्य/पद्य) लेखन के महत्वपूर्ण पहलू, एवं हिंदी के शब्दों के उच्चारण संबंधी त्रुटियाँ, समाधन एवं अभ्यास



Krishi Vigyan Kendra (KVK), Fazilka

Krishi Vigyan Kendra, an innovative science–based Institution, was established to accelerate the agricultural production and post-harvest management and to improve the socioeconomic conditions of the farming community of Fazilka district. This KVK was reestablished at ICAR-Central Institute of Post-Harvest Engineering and Technology, Abohar (Fazilka) on 20 October 2016. This KVK is involved in vocational training programmes, on-farm testing and front-line demonstration on major agricultural technologies in order to make the training of farmers' location specific, need based and resource orientated. It runs the need based skilled oriented training programme for creating job opportunities for rural community. It also acts as a facilitator to coordinate the extension activities of different departments for the benefit of the farmers. The KVK also helps in disseminating post-harvest management technologies for improving the economic status of the rural community.

Trainings Organized

Vocational Training

Programme Title	Number of Participants	Duration
Beekeeping	31	21-23 Feb 2022
Value Addition of Grains and Pulses for Farm Women	30	11-13 May 2022
Masala Making	26	29-31 Aug 2022
Beekeeping	42	15-17 Nov 2022
Covered Cultivation of Vegetables	24	30 Nov-02 Dec 2022

On-Campus Training

Programme Title	Number of Participants	Duration
Value Addition of Milk and Milk Products	42	20-22 Jan 2022
Management of Infertility in Dairy Animals	61	27-29 Jan 2022
Commercial Pig Farming and its Export Potentials	32	24-26 Feb 2022
Management of Paddy Straw including Silage Making	20	7-9 Mar 2022
Integrated Farming System with Special Reference of Crop-Livestock Integration	23	15-17 Mar 2022
Soil and Nutrient Management in Kharif Crops	14	12 Apr 2022
Fruit Drop and Disorder Management in Kinnow	09	13 Apr 2022
Management of Pest and Diseases in Summer Vegetables	11	14 Jun 2022
Vermicompost through Earth Worms	28	15 Jun 2022
Efficient and balanced use of fertilizer including Nano fertilizers	40	21 Jun 2022

Programme Title	Number of Participants	Duration
Pest and diseases management on kharif crops with emphasis on pink boll worm	6	12 Jul 2022
Nursery Management Techniques	32	15 Jul 2022
Mechnaized Processing of Fruits and Vegetables	30	22-23 Aug 2022
Management of Pest and Diseases in Winter Vegetables	26	14 Sep 2022
Pest and Disease Management in Rabi crops	06	14 Oct 2022
Soil and Nutrient Management in Rabi crops	23	25 Nov 2022
Processing and Preservation for Fruit based Product Development	26	12-14 Dec 2022

Off-Campus Training

Programme Title	Number of Participants	Duration
Management of Poshan Vatika	50	9 Feb 2022
Processing and Value Addition of Tomato	41	9 May 2022
Development of Low Cost Balance Diet	34	25 Jul 2022
Pickle Making	63	29 Jul 2022
Drudgery Reduction Techniques for Farm Women	35	27 Jul 2022
Diet Management for Pregnant and Lactating Mothers	24	22 Nov 2022
Drying Technology for Vegetables	45	23 Nov 2022
Value Addition of Dairy Products	24	28 Nov 2022

Awareness Campaign

Programme Title	Number of Participants	Duration
Atmanirbhar Bharat- Harnessing Potential Pulses for Import Substitution	30	10 Feb 2022
Awareness Program on Fishery Farming	35	3 Jun 2022
Parthenium Awareness Week	20	16-22 Aug 2022

Crop Residue Management Activities

Field Day

Programme Title	Venue	Number of Participants	Duration
In-situ Crop Residue Management	Raipura	24	22 Mar 2022

Awareness Programme

Programme Title	Venue	Number of Participants	Duration
District level capacity building and awareness generation for combating Environmental Pollution by Biomass burning and improving livelihoods by promoting circulatory rural economy in collaboration with CRRID, Chandigarh	KVK, Fazilka	80	07 Mar 2022
College level awareness campaign on CRM	Waheguru College, Abohar	45	14 Mar 2022
School level awareness campaign on CRM	Govt High School, God Liye	40	24 Sep 2022
Village level awareness campaign on CRM	Dhai Sucha Singh	46	28 Sep 2022
College level awareness campaign on CRM	Waheguru College, Abohar	100	28 Oct 2022
Block level awareness campaign on CRM	KVK, Fazilka	60	17 Oct 2022

Webinars Organized

Webinar Topic	Speaker	Date	No. of particpants
Nutrition Diet Management	Dr Rupinder Kaur	8 Sep 2022	41

Live Telecast of Programmes & Melas Organized

Programme Title	Date	No. of particpants
Live telecast of PM on *Kisan Bhagidhari Prathmikta Hamari & Kisan Mela cum Sangoshti*	26 April 2022	264
Live telecast of PM on *Garib Kaliyan Samelan* & *Kisan Mela*	31 May 2022	419
Live telecast of PM *Kissan Sammelan* organized at ICAR-IARI, New Delhi	17 Oct 2022	65

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ख्वाईराकपम बेमबेम, रेणु बालाकृष्णन और थ. बिद्यालक्ष्मी देवी (2022). प्याज और सूखे गुच्छे और पाउडर का मूल्यवर्धन। भाकृ अनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित "प्याज, लहसुन और मिर्च का प्रसंस्करण और मूल्यवर्धन" प्रशिक्षण पुस्तिका पृष्ठ संख्या 5–6।

चंदन सोलंकी एवं दीपिका गोस्वामी (2022). एक्सत्रुजन तकनीक का उपयोग करके खाद्यानो का प्रसंसकरण, भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा आत्मा गया (बिहार) के अंतर्गत प्रकाशित किसान कृषि उत्पादों का फसलोत्तर प्रबंधन– प्रशिक्षण पुस्तिका, पृष्ठ संख्या 13–18।

चंदन सोलंकी एवं दीपिका गोस्वामी (2022). फलों एवं सब्जियों के कटाई उपरांत प्रसंस्करण एवं मूल्यवर्धन, भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा एस. सी.एस. पी के अंतर्गत प्रकाशित प्रशिक्षण पुस्तिका, पृष्ठ संख्या 18–21।

चंदन सोलंकी एवं पंकज कुमार (2022). फलों एवं सब्जियों के कटाई उपरांत प्रसंस्करण एवं मूल्यवर्धन पर भाकृअनुप–केंद्रीय कटाई– उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा एस. सी.एस. पी के अंतर्गत प्रकाशित प्रशिक्षण पुस्तिका, पृष्ठ संख्या 84–88।

चंदन सोलंकी एवं मृदुला डी (2022). कुट्टू का प्रसंस्करण, कटाई उपरांत अनाज, कदन्न और दालो का प्रसंस्करण एवं मूल्य संवर्धन भाकृ अनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा एस. सी.एस. पी के अंतर्गत प्रकाशित प्रशिक्षण पुस्तिका, पृष्ठ संख्या 134–136।

चंदन सोलंकी एवं विकास कुमार (2022). मिलेट का प्रसंसकरण और मूल्यवर्धन. भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा आत्मा गया (बिहार) के अंतर्गत प्रकाशित – प्रशिक्षण पुस्तिका, पृष्ठ संख्या 16–27।

चंदन सोलंकी एवं विकास कुमार (2022). मिलेट का प्रसंसकरण और मूल्यवर्धन. भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा आत्मा दरभंगा (बिहार) के अंतर्गत प्रकाशित – प्रशिक्षण पुस्तिका, पृष्ठ संख्या 34–40।

टी एच विद्यालक्ष्मी देवी, ख्वैराकपम बेमबेम, रेणु बालाकृष्णन एवं पूनम चौधरी (2022). अदरकः संभावित लाभ और इसके मूल्य वर्धित उत्पाद। भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना,

पंजाब द्वारा प्रकाशित "प्याज, लहसुन और मिर्च का प्रसंस्करण और मूल्यवर्धन" प्रशिक्षण पुस्तिका (संपादकः महेश कुमार सामोता, पूनम चौधरी, हरफूल सिंह, लाला राम बलाई) ।

पूनम चौधरी एवं महेश कुमार समोता (2022). प्याज और लहसुन के मूल्यवर्धित उत्पादों की निर्यात क्षमता। भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित "प्याज, लहसुन और मिर्च का प्रसंस्करण और मूल्यवर्धन" प्रशिक्षण पुस्तिका (संपादकः महेश कुमार सामोता, पूनम चौधरी, हरफूल सिंह, लाला राम बलाई)।

पूनम चौधरी एवं महेश कुमार समोता (2022). मिर्च का फसलोत्तर प्रसंस्करण और मूल्य संवर्धन। भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित "प्याज, लहसुन और मिर्च का प्रसंस्करण और मूल्यवर्धन" प्रशिक्षण पुस्तिका (संपादकः महेश कुमार सामोता, पूनम चौधरी, हरफूल सिंह, लाला राम बलाई)।

पूनम चौधरी एवं महेश कुमार समोता (2022). लहसुन का कटाई उपरांत प्रबंधन। भाकृ अनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित "प्याज, लहसुन और मिर्च का प्रसंस्करण और मूल्यवर्धन" प्रशिक्षण पुस्तिका (संपादकः महेश कुमार सामोता, पूनमचौधरी, हरफूल सिंह, लाला राम बलाई)।

पूनम चौधरी, सूर्या तुषिर एवं मंजू बाला (2022). सेब पोमेस का मूल्यवर्धन। भाकृअनुप– केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित "हिमाचल प्रदेश के समशीतोष्ण क्षेत्र के फलों और सब्जियों का फसलोत्तर प्रबंधन और प्रसंस्करण" प्रशिक्षण पुस्तिका (संपादकः रमेश चन्द कसाणा, विकास कुमार, जगदीश वर्मा, चमेली नेगी), पृष्ठ संख्या 68–101।

महेश कुमार सामोता एवं पूनम चौधरी (2022). लहसुन के गुणकारी उत्पाद। भाकृअनुप– केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित "प्याज, लहसुन और मिर्च का प्रसंस्करण और मूल्यवर्धन" प्रशिक्षण पुस्तिका (संपादकः महेश कुमार सामोता, पूनम चौधरी, हरफूल सिंह, लाला राम बलाई)।

महेश कुमार सामोता, दीपिका गोस्वामी एवं चंदन सोलंकी (2022). फलों एवं सब्जियों के कटाई उपरांत प्रसंस्करण एवं मूल्यवर्धन भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा एस सी एस पी के अंतर्गत प्रकाशित प्रशिक्षण पुस्तिका, पृष्ठ संख्या 22–27।

राहुल कुमार अनुराग एवं चंदन सोलंकी (2022). फलों एवं सब्जियों के कटाई उपरांत प्रसंस्करण एवं मूल्यवर्धन। भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा एस सी एस पी के अंतर्गत प्रकाशित प्रशिक्षण पुस्तिका, पृष्ठ संख्या 6–17।

राहुल कुमार अनुराग एवं चंदन सोलंकी (2022). फलों एवं सब्जियों के कटाई उपरांत प्रसंस्करण एवं मूल्यवर्धन भाकृअनुप–केंद्रीय कटाई–उपरांत

अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा एस सी एस पी के अंतर्गत प्रकाशित प्रशिक्षण पुस्तिका, पृष्ठ संख्या 8–40।

राहुल कुमार अनुराग एवं पंकज कुमार (2022). प्रसंकरण उद्यमिता में फल तथा सब्जियों की पैकेजिंग सामग्री का चयन एवं महत्व. भाकृ अनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित प्रशिक्षण पुस्तिका, फलों तथा सब्जियों के फसलोत्तर प्रसंस्करण एवं मूल्यवर्धन पर कौशल विकास प्रशिक्षण, भा.कृ.अनु.प– सीफेट, लुधियाना, पृष्ठ संख्या 108–117।

राहुल कुमार अनुराग एवं पंकज कुमार (2022). फलों और सब्जियों का प्राथमिक और न्यूनतम प्रसंस्करण। भाकृअनुप–केंद्रीय कटाई–उपरांत अभियांत्रिकी एवं प्रौद्योगिकी संस्थान, लुधियाना, पंजाब द्वारा प्रकाशित प्रशिक्षण पुस्तिका, फलों तथा सब्जियों के फसलोत्तर प्रसंस्करण एवं मूल्यवर्धन पर कौशल विकास प्रशिक्षण, भा.कृ. अनु.प–सीफेट, लुधियाना, पृष्ठ संख्या 118–127।

Participation in conferences, symposia, workshops, meetings

Saha, D. (2022). Prediction of protein content in chickpea flour using Near-Infrared (NIR) hyperspectral imaging. Paper presented at the CSBE/SCGAB AGM and Technical Conference 2022 (in-person) organized by Canadian Society for Bioengineering (CSBE), held on July 24-27, 2022, at Charlottetown, Prince Edward Island, Canada.

Saha, D. (2022). Evaluation of convolution neural network (CNN) models to classify chickpea varieties for real-time deployment. Poster presented at the Canadian Food Summit-Propelling Research and Innovation (in-person) organized by Canadian Institute of Food Science and Technology (CIFST), held on June 1-3, 2022, at University of Guelph, Ontario, Canada.

Kaur R. (2022). Participated in XII Biennial National Conference of KVK 2022 held at YSP University of Forestry and Horticulture, Nauni, Solan during 01-02 June 2022.

Dr. Sandeep P. Dawange, Scientist attended and delivered online expert lecture on "Agricultural Processing Enterprises for Farmers – A need of future" during 'Virtual Farmer Scientist Forum Programme' organised by Krishi Vigyan Kendra, Aurangabad (MH) on 01 March 2022.

डॉ. संदीप पोपटराव दवंगे, वैज्ञानिक ने बुरहानपुर, मध्य प्रदेश में 12–14 मार्च 2022 के दौरान आयोजित 'फसल विविधीकरण अंतर्गत मसाला फसलों के उत्पादन, प्रसंस्करण एवं प्राकृतिक खेती के प्रोत्साहन हेतु राष्ट्रीय कार्यशाला' में भाग लिया। इस दो दिवसीय राष्ट्रीय कार्यशाला में सहभागी 1400 किसानों को निम्नलिखित विषयों पर संबोधित किया गया। 1. 'मसाला फसलों के प्रसंस्करण के लिए प्रौद्योगिकियां और अवसर' 2. 'कृषि उत्पादों के प्रसंस्करण और मूल्यवर्धन हेतु मशीन एवं तकनीक'।

Leflets



CIPHET - Live Fish Carrier System

Low-Fat Meat Emulsion Based Products

GLUTEN FREE QUALITY PROTEIN MAIZE MUFFINS

FISH DRESSING AND WASTE COLLECTION SYSTEM (FDACS)

INDIGENOUS MEAT FORMING MACHINE

BARNYARD MILLET MUFFINS


MAKHANA PRIMARY ROASTING MACHINE

MAKHANA POPPING MACHINE


MAKHANA KHEER MIX

CIPHET-POPPED MAKHANA GRADING MACHINE

FAT FREE FLAVORED MAKHANA

TARO PEELER

WADI MAKING MACHINE

SOLAR OPERATED PHASE CHANGE MATERIAL BASED FRUITS-VEGETABLES VENDING PUSH CART

Antioxidant Rich Jamun Bar

GROUNDNUT BASED BEVERAGE, CURD & PANEER


ROSE PETAL JAM

LOW-COST AIR MODIFICATION SYSTEM

Prioritization, Monitoring and Evaluation (PME) Cell

This cell helps in setting a unified priority and monitoring of externally funded and in house projects. PME cell of the institute conducts Institute Research Council meeting and maintains the record of research projects. The monthly and quarterly reports of individual scientists are collected and compiled into progress reports, quarterly and half yearly performance review reports. It also acts as link between the council and the institute scientists. The database of parliament questions and their answers, action taken reports and issues related to scientific activities of the institute are dealt by PME cell. The research information related to ongoing and completed research projects is uploaded through Project Information and Management System (PIMS) software for digital management of research projects.

Research Projects (2022)

Institute Funded

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
1.	Production of bio-active ingredients from mango seed kernels	Dr. Poonam (PI)	01.10.2018	31.03.2022	01.10.2018 31.03.2022
		Dr. Th. Bidyalakshmi (Co-PI)	01.10.2018	31.03.2022	
		Er. Sandeep Dawange Poputrao (Co-PI)	01.10.2018	31.03.2022	
	Development of a prototype for separation of peel and stone from mango processing waste	Dr. Manoj Kumar Mahawar (PI)	01.06.2019	30.11.2019	01.06.2019 31.05.2022
		Dr. Kirti Jalgaonkar (Co-PI)	01.06.2019	30.11.2019	
		The project is resumed for 01-year w.e.f. 01.07.2021 with only PI.			
		Dr. Sandeep Dawange Popatrao (PI)	01.07.2021	30.06.2022	
2.	Development of Lab-on-a-Chip method for detection of animal species in meat products	Dr. Yogesh Kumar (PI)	01.04.2019	31.03.2022	01.04.2019 31.03.2023
		Dr. K Narsaiah (Co-PI)	01.04.2019	28.10.2022	
		Dr. Tanbir Ahmad (Co-PI)	01.04.2019	30.11.2019	
		Dr Poonam (Co-PI) & (PI)	01.04.2019	Till-date	

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
3.	Development of Infra-Red Spectroscopy Based Rapid Detection Methods for Adulterants in Chickpea flour (*Besan*)	Dr. Manju Bala (PI)	01.04.2019	31.03.2022	01.04.2019 31.03.2022
		Dr. Swati Sethi (Co-PI)	01.04.2019	31.03.2022	
		Mrs. P. Hemasankari (Co-PI)	01.04.2019	30.11.2019	
4.	Development of mechanized system for deodorization and safe handling of dried fish	Dr A.U. Muzaddadi (PI)	01.04.2019	31.03.2022	01.04.2019 31.03.2022
		Dr. Sandeep Mann (Co-PI)	01.04.2019	31.03.2022	
		Dr. Kh. Bembem (Co-PI)	01.04.2019	31.03.2022	
		Dr. Bipul Kakati (Co-PI) (College of Fishery, AAU, Raha)	01.04.2019	31.03.2022	
		Dr. Guru P.N (Co-PI)	27.02.2020	31.03.2022	
5.	Development of enzyme assisted technology for enhancing protein extraction from de-oiled rice bran.	Ms. Surya (PI)	01.10.2020	Till Date	01.10.2020 30.09.2023
		Dr. D.N. Yadav (Co-PI)	01.10.2020	Till Date	
		Dr. Rajeev K. Kapoor (Co-PI), MDU, Rohtak, Haryana	01.10.2020	Till Date	
6.	Development of Photoreactor for Ethylene Degradation During Storage of Banana and Guava	Dr. Bhupendra M Ghodki (PI)	01.10.2020	Till Date	01.10.2020 30.09.2023
		Er. Yogesh Kalnar (Co-PI)	01.10.2020	28.10.2022	
		Dr. Poonam (Co-PI)	01.10.2020	Till Date	
7.	Development of Tabletop Vaccum Frying System	Dr. Swati Sethi (PI)	01.10.2020	Till Date	01.10.2020 30.09.2022
		Dr. Pankaj Kumar (Co-PI)	01.10.2020	Till Date	
8.	Microbial production of PolyHydroxy Butyrate (bioplastic) using mango by products	Dr. Ajinath Dukare (PI)	01.10.2020	02.03.2021	01.10.2020 31.03.2023
		Sh. Mahesh Kumar Samota (Co-PI)	01.10.2020	Till Date	
		Dr. Bibwe Bhushan Ratnagar (Co-PI)	01.10.2020	13.11.2020	
		Dr. R.C. Kasana (PI)	01.07.2021	Till Date	
		Dr, Ramesh Kumar (Co-PI)	01.07.2021	Till Date	
9.	Development of Solar Operated Low-Cost Onion Storage Structure	Dr. Sakharam Kale (PI)	01.10.2020	29.10.2021	01.10.2020 30.09.2022
		Dr. Dr. Ajinath Dukare (Co-PI)	01.10.2020	02.03.2021	
		Sh. Mahesh Kumar Samota (Co-PI) & (PI)	01.10.2020 30.10.2021	29.10.2021 Till Date	

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
10.	Development and Updating of Post-Harvest Machineries & Technologies Database	Dr Sandeep Mann (PI)	01.10.2020	Till Date	01.10.2020 30.09.2023
		Dr Sandeep P. Dawange (Co-PI)	01.10.2020	Till Date	
		PC PHET/Scientist Er Akhoon Asrar Bashir (Co-PI)	01.10.2020	23.06.2022	
		PC PEASEM/ Scientist Er. Navnath Indore (Co-PI)	01.10.2020	07.01.2021	
11.	Development of android based mobile application (Mobile app) on post-harvest technology for skill development and employment security	Dr. Ranjeet Singh (PI)	01.10.2020	28.06.2022	01.10.2020 30.09.2023 Merged with the project Development and Updating of Post-Harvest Machineries & Technologies Database from June 2022
		Er. Thongam. Sunita Devi (CoPI)	01.10.2020	28.06.2022	
12.	Mechanized system for making Hawaijar- a traditional fermented food of North-East India	Dr. Th. Bidyalakshmi Devi (PI)	01.04.2021	30.09.2021	01.04.2021 31.03.2023 Merged with the externally funded project from 30 Sept 2021
		Mrs Surya (Co-PI)	01.04.2021	30.09.2021	
		Dr. K. Bembem (Co-PI)	01.04.2021	30.09.2021	
13.	IoT-Based Real-Time Intelligent Monitoring and Controlling System for Cold Storage	Er. Thongam Sunita Devi (PI)	01.07.2021	Till Date	01.07.2021 30.06.2023
		Er. Shaghaf Kaukab (Co-PI)	01.07.2021	Till Date	
		Er. Yogesh B. Kalnar (Co-PI)	01.07.2021	28.10.2022	
		Dr. Nachiket Kotwaliwale (Co-PI)	01.07.2021	Till Date	
14.	Development of process for improved head rice recovery from long grain paddy	Dr. Swati Sethi (PI)	01.07.2021	Till Date	01.07.2021 30.06.2023
		Dr. Mridula D. (Co-PI)	01.07.2021	11.11.2022	
		Dr. R. K. Vishwakarma (Co-PI)	01.07.2021	Till Date	
15.	Development of on farm maize cob drying system for effective value chain	Dr. Pankaj Kumar (PI)	01.07.2021	Till Date	01.07.2021 30.06.2023
		Er. Shaghaf Kaukab (Co-PI)	01.07.2021	Till Date	
		Dr. Sumit Kumar Aggarwal (Co-PI), ICAR-IIMR Ludhiana	01.07.2021	Till Date	

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
16.	Safe storage of pulses using microwave assisted disinfestation	Dr. Guru P. N. (PI)	01.07.2021	Till Date	01.07.2021 31.12.2022
17.	Development of Low-Calorie beverages and Utilization of syrup waste during osmotic dehydration of aonla & mango	Dr. Prerna Nath (PI)	01.07.2021	29.10.2021	01.07.2021 30.06.2022
		Dr. Ramesh Kumar (Co-PI)	01.07.2021	30.06.2022	
		Dr. R. C. Kasana (Co-PI)	01.07.2021	30.06.2022	
18.	Capacity building of agricultural extension professionals to promote agro processing	Dr. Renu Balakrishnan (PI)	01.07.2021	Till Date	01.07.2021 30.06.2024
		Dr. Khwairakpam Bembem (Co-PI)	01.07.2021	Till Date	
		Dr. Deep Narayan Yadav (Co-PI)	01.07.2021	Till Date	
		Mr. Vikas Kumar (Co-PI)	01.07.2021	Till Date	
19.	Techno-economic feasibility assessment and socio-economic impact analysis of selected post-harvest technologies	Dr. Renu Balakrishnan, (PI)	01.07.2021	Till Date	01.07.2021 30.06.2024
		Dr Sandeep Mann, Pr. (Co-PI)	01.07.2021	Till Date	
		Dr Ankita Kandpal, (Co-PI) - ICAR-NIAP, New Delhi	01.07.2021	Till Date	
		Dr Reshma Gills, (Co-PI) - ICAR-CMFRI, Kochi	01.07.2021	Till Date	
20.	Biochemical and genetic characterization of black soybean varieties with enhanced nutritive value (Inter-Institutional collaborative Research Project)	Dr. Manju Bala (Co-PI)	09.08.2022	Till date	01.07.2021 30.06.2024
		Dr. M.K. Srivastava (PI) ICAR- IISR, Indore (MP)	01.07.2021	Till date	
		Dr. Anuradha Bhartiya (CC-PI), ICAR-VPKAS, Almora, Uttarakhand	01.07.2021	Till date	
		Dr. Subhash Chandra (Co-PI), ICAR- IISR, Indore (MP)	01.07.2021	Till date	
		Dr. M. K. Kuchlan Senior (Co-PI), ICAR- IISR, Indore (MP)	01.07.2021	Till date	
21.	Development of mushroom mycelium based eco-friendly packaging materials utilizing crop residues	Dr. R.C. Kasana (PI)	01.07.2022	Till date	01.07.2022 30.06.2024
		Dr. B.M. Ghodki (Co-PI)	01.07.2022	Till date	
		Dr Anil Kumar (Co-PI), ICAR- DMR Solan	01.07.2022	Till date	

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
22.	Biospeckle laser technique for post-harvest quality and safety evaluation of agricultural produce	Er. Shaghaf Kaukab (PI)	01.07.2022	Till date	01.07.2022 30.06.2025
		Dr. R. C. Kasana (Co-PI)	01.07.2022	Till date	
		Dr. Khwairakpam Bembem (Co-PI)	01.07.2022	Till date	
23.	Development and optimization of 3D food Printing system for designer foods	Dr. Leena Kumari (PI)	01.07.2022	Till date	01.07.2022 30.06.2024
		Dr. Deepika Goswami (Co-PI)	01.07.2022	Till date	
		Er. Thongam Sunita Devi (Co-PI)	01.07.2022	Till date	
24.	Development of commercial-scale millet processing plant	Dr. Chandan Solanki (PI)	01.07.2022	Till date	01.07.2022 30.06.2023
		Dr. R.K. Vishwakarma (Co-PI)	01.07.2022	Till date	
25.	Valorisation of by-products from peanut (*Arachis hypogea* L.) milk processing	Dr. Khwairakpam Bembem (PI)	01.07.2022	Till date	01.07.2022 30.06.2024
		Dr. DN Yadav (Co-PI)	01.07.2022	Till date	
26.	Development of automatic Batasha making machine	Dr. Sandeep Dawange (PI)	01.07.2022	Till date	01.07.2022 31.12.2023
		Dr. Sandeep Mann (Co-PI)	01.07.2022	Till date	

ICAR Funded Projects

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
	AICRP on PEASEM				
1.	Development of phase change material based assembled type fruit ripening chamber	Dr. Sakharam Kale (PI)	01.04.2020	29.10.2021	01.04.2020 31.08.2022
		Mr. Mahesh Kumar Samota (PI)	01.04.2022	31.08.2022	
	NAIF				
1.	Establishment of Agri-Business Incubation (ABI) Centre under XII Plan Scheme for National Agriculture Innovation Fund (NAIF) at ICAR-CIPHET, Ludhiana	Dr. Ranjit Singh (PI)	31.10.2016	Till date	01.01.2016 Till Date
		Dr. Vikas Kumar (Co-PI)	21.09.2016	Till date	
		Dr. Renu Balakrishnan (Co-PI)	21.09.2016	Till date	

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
	CRP on SA				
1.	Reformation of Makhana processing and value-addition industry through mechanization and automation.	Dr. R.K. Vishwakarma (PI)	01.04.2021	Till date	01.04.2021 31.03.2026
		Dr. Mridula D. (Co-PI)	01.04.2021	11.11.2022	
		Dr. Ranjeet Singh (Co-PI)	01.04.2021	Till date	
		Dr. Kh. Bembem (Co-PI)	01.04.2021	Till date	
		Dr. Guru P.N. (Co-PI)	01.09.2022	Till date	
2.	Extraction of bioactive compounds and value addition of by-products of agri-produce	Dr. Mridula D. (PI)	01.04.2021	11.11.2022	01.04.2021 31.03.2026
		Dr. Deepika Goswami (Co-PI)	01.04.2021	Till date	
		Er. Akhhon Asrar (Co-PI)	01.04.2021	23.06.2022	
		Dr. Manju Bala (Co-PI)	01.09.2022 21.12.2022	20.12.2022 Till date	
	FFP				
1.	Processing and Value Addition of Agricultural Produce for Enhancing Farmers income and Employment in Production Catchment under Farmer First Programme	Dr. Sandeep Mann (PI)	30.01.2017	Till date	30.01.2017 31.03.2023
		Dr. Rahul Kumar Anurag (Co-PI)	01.04.2020	Till date	
		Dr. Renu Balakrishnan (Co-PI)	01.04.2020	Till date	
		Er. Yogesh Kalnar (Co-PI)	01.04.2020	28.10.2022	
		Dr. B.V.C Mahajan (Co-PI) Director & Prof., (PHPTC)	01.04.2020	Till date	
	NePPA				
1.	Development of image (Visual and X-Ray) based mango sorting and grading system and sensor-based monitoring system with block chain technology for supply chain of banana	Dr. Nachiket Kotwaliwale Director (Mentor)	08.09.2021	Till date	08.09.2021 07.09.2025
		Dr. K. Narsaiah (PI)	08.09.2021	28.10.2022	
		Er. Yogesh B. Kalnar (Co-PI)	08.09.2021	28.10.2022	
		Dr. Bhupendra M. Ghodki (Co-PI)	08.09.2021	Till date	
		Dr. Leena Kumari (Co-PI) & PI	08.09.2021 14.12.2022	Till date	
		Dr. Thingujam Bidyalakshmi Devi (Co-PI)	08.09.2021	Till date	
		Er. Thongam Sunita Devi, (Co-PI)	08.09.2021	Till date	
		Dr. P. Suresh Kumar, (CC-PI)	08.09.2021	Till date	

Externally Funded Projects

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
1.	Development of Hand-Held Instrument for Non-Destructive Quality Testing of Mango	Dr. K. Narsaiah (PI)	01.10.2019	28.10.2022	01.10.2019 31.03.2023
		Dr. Poonam Chaudhary (Co-PI)	14.12.2022	Till date	
2.	Mechanized system for making Hawaijar - a traditional fermented food of North-East India by DSIR	Dr Thingujam Bidyalakshmi (PI)	17.09.2021	Till Date	17.09.2021 30.09.2023
		Ms. Surya (Co-PI)	17.09.2021	Till Date	
		Dr. Khwairakpam Bembem	17.09.2021	Till Date	
		Dr. Ng. Joy Kumar (Co-PI from CoFT, CAU, Imphal)	17.09.2021	Till Date	
3.	Non-chemical management of stored-grain moths using flexible light-trap by DST	Dr. Guru P.N. (PI)	01.10.2020	Till date	01.10.2020 30.09.2023
		Er. Yogesh Kalnar (Co-PI)	01.10.2020	28.10.2022	
4.	Vision guided AI-enabled Robotic Apple Harvestor Under National Programme on Electronics and ICT Applications in Agriculture and Environment (Agrienlcs) funded by MeitY-GOI-C-DAC, Kolkata	Er. Yogesh Kalnar (PI)	17.03.2022	28.10.2022	17.03.2022 16.03.2024
		Dr. K. Narsaiah (Co-PI)	17.03.2022	28.10.2022	
		Dr. Bhupendra M Ghodki (Co-PI)	17.03.2022	Till date	
		Er. Shaghaf Kaukab (Co-PI) and PI w.e.f.	15.11.2022 17.03.2022	Till date	

Consultancy Projects

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
1.	Storage study on Performance Evaluation of Hermetic Bags on selected commodities	Dr. Sandeep Mann (PI)	01.10.2020	Till date	01.10.2020 31.03.2023
		Mrs. Surya (Co-PI)	01.10.2020	Till date	
		Dr. Guru P.N. (Co-PI)	01.10.2020	Till date	
		Dr. R.K. Singh (Co-PI)	01.10.2020	Till date	
2.	Performance Testing of MATT – Grain Quality Analyser	Dr. Nachiket Kotwaliwale (PI)	14.02.2022	27.04.2022	03.03.2022 27.04.2022
		Dr. Sandeep Mann (Co-PI)	14.02.2022	27.04.2022	
		Er. Yogesh Kalnar (Co-PI)	14.02.2022	27.04.2022	
3.	Confidential Test Report on Performance of Optical Fruit Grading Machine	Dr. Nachiket Kotwaliwale (PI)	06.04.2022	31.05.2022	06.04.2022 31.05.2022
		Dr. R.K. Vishwakarma (Co-PI)	06.04.2022	31.05.2022	
		Er. Yogesh Kalnar (Co-PI)	06.04.2022	31.05.2022	

Sr. No.	Project Name	Project Leader & Associates	Period of Association		Project period
			From	To	
4.	Confidential Test Report on computer vision-based physical grain analyzer, NIR based chemical assessment device and capacitance-based moisture meter (AgNext)	Dr. R.K. Vishwakarma (PI)	17.05. 2022	08.08.2022	17.05. 2022 08.08.2022
		Dr. Nachiket Kotwaliwale (Co-PI)	17.05. 2022	08.08.2022	
		Dr. Manju Bala (Co-PI)	17.05. 2022	08.08.2022	
		Er. Yogesh Kalnar (Co-PI)	17.05. 2022	08.08.2022	
		Er. Shaghaf Kaukab (Co-PI)	17.05. 2022	08.08.2022	
		Er. Thongam Sunita Devi (Co-PI)	17.05. 2022	08.08.2022	
5.	Consultancy Project to facilitate ASCI for competency-based content development for the “Packhouse Worker” Job Role	Dr. Nachiket Kotwaliwale (PI and Chief Editor)	20.11.2021	Till date	20.11.2021 19.04.2022
		Dr. Sandeep Mann (Co-PI and Editor)	20.11.2021	Till date	
6.	Confidential Test Report on Performance of AI-based Automatic Grain Analyser (AI-AGA)”	Dr. R.K., Vishwakarma (PI)	17.09.2022	17.11.2022	17.09.2022 17.11.2022
		Dr. Nachiket Kotwaliwale (Co-PI)	17.09.2022	17.11.2022	
		Er. Yogesh B. Kalnar (Co-PI)	17.09.2022	28.10.2022	
		Dr. Bhupendra M Ghodki (Co-PI)	17.09.2022	17.11.2022	

Research and Administrative Meetings

24th Research Advisory Committee Meeting (RAC)

The ICAR vide File No. Ag. Engg./2/10/2020-IA-II Efile No. 104118 dated 14.01.2021 constituted Research Advisory Committee for ICAR-CIPHET, Ludhiana for a period of three years w.e.f. 31 January 2021- 30 January 2024. The Second meeting of the Research Advisory Committee (RAC) was held during 10-11 March 2022 at ICAR-CIPHET, Ludhiana, through online as well as physical presence of the members. The Chairman & RAC members attended the meeting along with the all Heads, Project Coordinators & Scientists of ICAR-CIPHET.

Research Advisory Committee

Dr. D. C. Joshi Vice Chancellor, Agriculture University, Kota	Chairman
Dr. R. ViswanathanFormer Prof. & Head, TNAU, Coimbatore	Member
Dr. H. N. Mishra Professor I/c & Nodal Officer, Agri Business Incubation Centre, Indian Institute of Technology, Kharagpur	Member
Dr. Meenakshi Singh Chief Scientist (Formerly at CFTRI and FSSAI), Technology Management Directorate – SeMI, New Delhi	Member
Dr. Kriti Bardhan GuptaFaculty, Center for Food and Agri-business Management, IIM, Lucknow	Member
Dr. Sunil Bhand Dean, Sponsored Research and Consultancy & Professor, Department of Chemistry, BITS Pilani, Goa Campus	Member
Dr. S. N. Jha ADG (PE), Division of Agricultural Engineering, ICAR, KAB II, New Delhi	Member (Ex-Officio)
Dr. Nachiket Kotwaliwale Director, ICAR-CIPHET, Ludhiana	Member
Dr. Sandeep Mann Principal Scientist, ToT Division & I/c PME, ICAR-CIPHET, Ludhiana	Member Secretary

Institute Research Council (IRC) Meeting

The 32nd & 33rd Institute Research Council Meeting of ICAR-CIPHET, Ludhiana was held through online mode during 30 May, 01-02 June & 28 June 2022 and on 15 December 2022 through offline mode at ICAR-CIPHET, Ludhiana under the chairmanship of Dr. Nachiket Kotwaliwale, Director, ICAR-CIPHET and Chairman IRC.

IJSC Meeting

An Institute Joint Staff Council meeting was held on 11 May 2022 at Abohar campus of ICAR-CIPHET to discuss the ATR of previous IJSC meeting and new agendas of the staff of the institute.

Staff Recreation Club Election Meeting

The General Body Meeting for the election of various positions of the Staff Recreation Club, ICAR-CIPHET, Ludhiana was held on 24 August 2022 . The newly constituted SRC is as:

Name	Post
Dr Ranjeet Singh	President
Sh Tarsem Singh	Vice-President
Sh Vishal Kumar	General Secretary
Ms Pragya Singh	Cultural Secretary
Sh Sanjay Kumar	Sports Secretary
Dr Deepika Goswami	Ladies Secretary
Sh Ajay Kumar	Cashier
Sh Iqbal Singh	Auditor

Personalia

Appointment/ Recruitment/ New Joining

Name of the Official	Date of Joining	Designation
Sh Sukhwinder Singh Sekhon	07.05.2022	Technical Assistant
Sh Permod Sharma	01.07.2022	Finance and Accounts Officer
Sh Ram Chand	07.11.2022	Principal Private Secretary

Superannuation/VRS

Name of the Official	Date of Retirement	Designation
Dr V K Saharan	31.07.2022	Chief Technical Officer

Promotion

Scientific

Name of the Official	Date of Promotion (CAS)	Designation/RGP
Dr Rahul Kumar Anurag	11.05.2019	Senior Scientist
Dr Deepika Goswami	15.12.2020	Senior Scientist
Dr Tanbir Ahmed	04.11.2019	Senior Scientist
Dr Dukare Ajinath Shridhar	01.07.2019	Scientist (Senior Scale)
Dr Pankaj Kumar Kannaujia	01.01.2020	Scientist (Senior Scale)
Er Akhoon Asrar Bashir	01.01.2020	Scientist (Senior Scale)
Er Indore Navnath Sakharam	01.01.2020	Scientist (Senior Scale)
Dr Renu Balakrishnan	01.01.2020	Scientist (Senior Scale)
Dr Khwairakpam Bembem	01.01.2020	Scientist (Senior Scale)
Dr Pankaj Kumar	05.07.2020	Scientist (Senior Scale)
Er Kalnar Yogesh	01.01.2021	Scientist (Senior Scale)
Dr Vikas Kumar	01.01.2021	Scientist (Senior Scale)
Dr Bhupendra M. Ghodki	05.01.2021	Scientist (Senior Scale)
Dr Poonam	05.01.2021	Scientist (Senior Scale)
Dr Thingujam Bidyalakshmi Devi	05.07.2021	Scientist (Senior Scale)
Dr Sandeep Popatrao Dawange	25.07.2022	Scientist (Senior Scale)

Technical

Name of the Official	Date of Promotion (CAS)	Designation/RGP
Sh Pawan Kumar	01.01.2022	Technical Officer (Electrician)
Sh Lakhwinder Singh	19.06.2022	Technical Officer (Fitter)
Sh Bhajan Singh	15.07.2022	Technical Officer (Fitter)
Sh Jaswant Singh	30.07.2022	Technical Officer (Welder)
Sh Satwinder Singh	09.11.2021	Technical Assistant (T-3)

Transfer

Name of the Official	Date of Transfer	Place of Transfer
Dr Yogesh Kumar, Scientist	13.04.2022	NRC- on Camel, Bikaner
Dr Mukund Narayan, ACTO	07.05.2022	ICAR-CIAE, Bhopal
Sh H L Meena, SAO	16.06.2022	ICAR-IIMR, Ludhiana
Dr K Narsaiah, Pr. Sceintist	28.10.2022	ICAR- Headquarters, New Delhi
Sh Permod Sharma, F&AO	31.10.2022	ICAR-IIMR, Ludhiana
Dr Mridula Devi, Pr. Scientist	12.11.2022	ICAR-CIWA, Bhubaneshwar

Institutional Staff

Ludhiana Campus

Scientific Staff

Name of the Official	Designation	Discipline
Dr Nachiket Kotwaliwale	Director	Agricultural Structures & Process Engineering
Dr S K Tyagi	Principal Scientist & Project Coordinator (Acting), AICRP (PHET)	Chemical Engineering
Dr R K Singh	Principal Scientist & Project Coordinator (Acting), AICRP (PEASEM)	Soil & Water Conservation Engineering
Dr D NYadav	Principal Scientist	Food Technology
Dr Sandeep Mann	Principal Scientist	Agricultural Structures & Process Engineering
Dr R K Vishwakarma	Principal Scientist	Agricultural Structures & Process Engineering
Dr Manju Bala	Principal Scientist	Plant Biochemistry
Dr A U Muzaddadi	Principal Scientist	Fish Processing Technology
Dr Ramesh Chand Kasana	Principal Scientist	Microbiology
Dr Ranjeet Singh	Principal Scientist	Agricultural Structures & Process Engineering
Dr Rahul K Anurag	Senior Scientist	Food Technology
Dr Deepika Goswami	Senior Scientist	Food Technology
Dr Leena Kumari	Scientist (SS)	Electronics & Instrumentation

Name of the Official	Designation	Discipline
Smt Surya	Scientist (SS)	Agricultural Microbiology
Dr Swati Sethi	Scientist (SS)	Food Technology
Dr Chandan Solanki	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Dhritiman Saha	Scientist (SS)	Agricultural Structures & Process Engineering
Er Akhoon Asrar Bashir**	Scientist (SS)	Agricultural Structures & Process Engineering
Er Navnath Indore**	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Vikas Kumar	Scientist (SS)	Fish Processing Technology
Dr Khwairakpam Bembem	Scientist (SS)	Home Science
Dr Renu Balakrishnan	Scientist (SS)	Agricultural Extension
Er Kalnar Yogesh**	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Pankaj Kumar	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Poonam	Scientist (SS)	Plant Biochemistry
Dr Bhupendra M Ghodki	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Sandeep Dawange	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Th Bidyalakshmi Devi	Scientist (SS)	Agricultural Structures & Process Engineering
Dr Guru P N	Scientist	Agricultural Entomology
Er Shaghaf Kaukab	Scientist	Agricultural Structures & Process Engineering
Er Thongam Sunita Devi	Scientist	Agricultural Structures & Process Engineering

**On study leave

Administrative Staff

Name	Designation
Sh Ramesh Chand Meena	Chief Administrative Officer
Sh Balwant Chand Katoch	Administrative Officer
Sh Manni Lal	Finance and Accounts Officer
Sh Ram Chand	Principal Private Secretary
Sh S S Verma	Personal Secretary
Sh Kunwar Singh	Assistant Administrative Officer
Sh Avtar Singh	Assistant Administrative Officer
Sh Tarsem Singh Purba	Assistant
Smt Jasvir Kaur	Assistant
Sh Gurdial Singh	Assistant
Sh Iqbal Singh	Assistant
Sh Ashwani Kumar	Assistant
Sh R K Raheja	Upper Division Clerk
Smt Sunita Rana	Upper Division Clerk
Sh R K Yadav	Upper Division Clerk
Sh S K Gaur	Upper Division Clerk
Sh Ajay Kumar	Lower Division Clerk

Technical Staff

Name	Designation
Sh Gurdeep Singh	Technical Officer
Sh H S Sekhon	Technical Officer
Sh Vishal Kumar	Technical Officer
Sh Beant Singh	Technical Officer
Sh Rajiv Sharma**	Technical Officer
Sh Lakhwinder Singh	Senior Technical Assistant
Sh Bhajan Singh	Senior Technical Assistant
Sh Jaswant Singh	Senior Technical Assistant
Sh Jaswinder Singh	Senior Technical Assistant
Sh Hardeep Singh	Senior Technical Assistant
Smt Sonia Rani	Senior Technical Assistant
Sh Pradip Kumar	Senior Technical Assistant
Sh Jagtar Singh	Senior Technical Assistant
Sh Yashpal Singh	Senior Technical Assistant
Smt Pragya Singh	Technical Assistant
Sh Sukhwinder Singh Sekhon	Technical Assistant
Sh Sarup Singh	Senior Technician
Sh Satwinder Singh	Senior Technician
Sh Manoj Kumar	Technician

** On study leave

Supporting Staff

Name	Designation
Sh Sukhbir	Skilled Supporting Staff

Abohar Campus

Scientific Staff

Name of the Official	Designation	Discipline
Dr Ramesh Kumar	Principal Scientist	Horticulture
Sh Mahesh Kumar Samota	Scientist	Plant Biochemistry

Administrative Staff

Name	Designation
Sh Pawan Kumar	Assistant Administrative Officer
Sh Mohan Lal	Assistant

Technical Staff

Name	Designation
Sh Prithvi Raj	Assistant Chief Technical Officer
Sh Rajesh Kumar	Assistant Chief Technical Officer
Sh Ganpat Ram (Driver)	Technical Officer
Sh Devinder Kumar	Technical Officer
Sh Pawan Kumar	Senior Technical Assistant
Sh Dalu Ram	Senior Technical Assistant

Supporting Staff

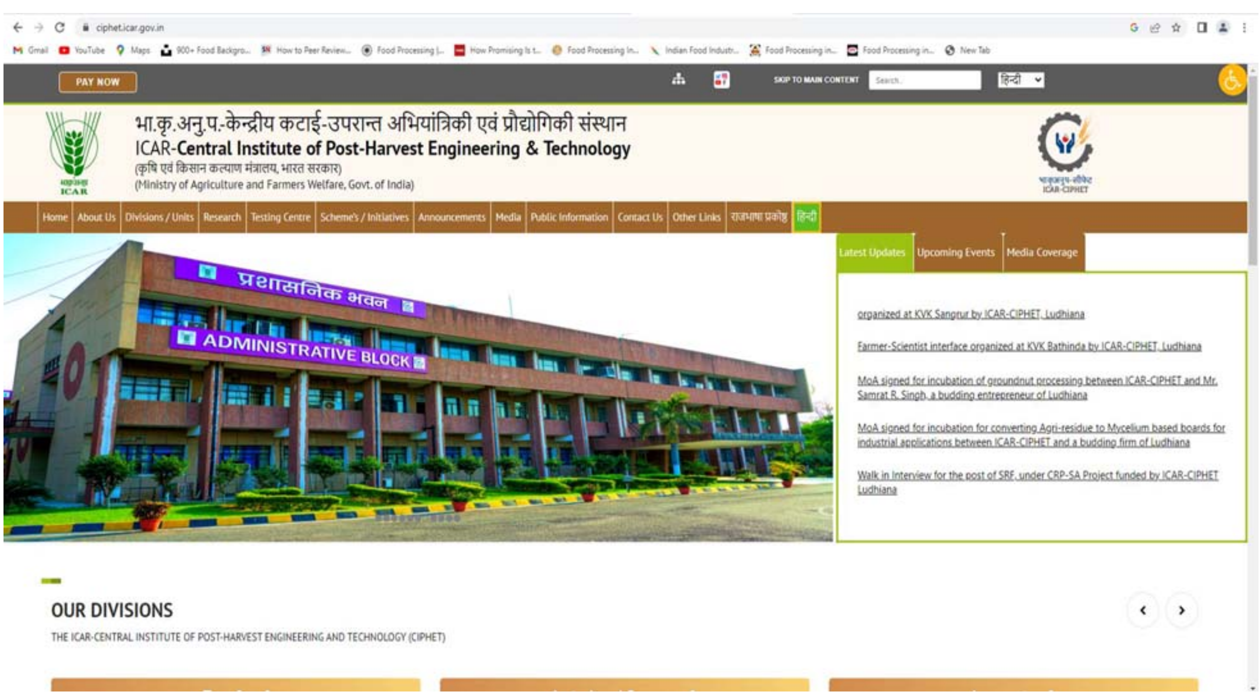
Name	Designation
Sh Surinder Kumar	Skilled Supporting Staff

Agricultural Knowledge Management Unit (AKMU)

AKMU of the institute helps in providing a necessary assistance in electronic communications and IT related management & software (data analysis) solutions. The AKMU owns a number analysis and design software such as Corel Draw Graphic Suite Software, Adobe Photoshop CS6 Software, Adobe Premier Pro Software (Creative Cloud Full Suite), MATLAB Software, Design Expert, MS-OFFICE Software, Design Expert Software, Google Hindi Input tools etc. and Upgrade Nebero Internet Management Solution software and Escan Total Security Suite for Business Anti-Virus (via Server/Network). The unit provides assistance to scientists and staff in data analysis, internet connectivity, online meeting arrangements, aadhaar based biometric attendance system and electronic/ telecommunication communication. AKMU also provide and maintains the facility of Wifi in the institute as well as in the residential colonies.

This year AKMU has redeveloped and maintaining ICAR-CIPHET Bilingual English & Hindi (Dynamic) Website (https://ciphet.icar.gov.in/) that is live and fully operational at ICAR-Data Center. Thereafter, the old website of ICAR-CIPHET (http://ciphet.in/) is permanently closed.

SBI Payment gateway has also been updated into the new website this year. Along with this AKMU has also developed additional page linked to the ICAR-CIPHET website (https://ciphet.icar.gov.in/indent/)for "Indent Management Tracking System" for tracking and management of the indents in the institute till its purchase.



ICAR-CIPHET in News

दैनिक भास्कर — लुधियाना भास्कर 03-01-2022

बड़ा ट्रेंड • सेंट्रल इंस्टीट्यूट ऑफ पोस्ट हार्वेस्ट इंजीनियरिंग व टेक्नोलॉजी की तैयार टेक्नोलॉजी को लुधियाना ही नहीं मुंबई में भी अपनाया जा रहा

वीगन डाइट पचने में आसान, जीरो कोलेस्ट्रॉल, दूध से तैयार पनीर के बजाए मूंगफली से तैयार लो फैट पनीर में 20% ज्यादा प्रोटीन, 1 किलो मूंगफली से बनता है 7 ली. दूध

सीफेट परिसर में स्वच्छता पखवाड़ा संपन्न

किसानों को जागरूक करते सीफेट अधिकारी।

अबोहर, (कथूरिया) : सीफेट अबोहर में 16 से 31 दिसंबर तक स्वच्छता पखवाड़े का आयोजन किया गया। ...

दैनिक सवेरा Sat, 01 January 2022 epaper.dainiksaveratimes.org/c/

ICAR- CIPHET inaugurated online certificate course on microbiological and biochemical techniques in industries

दैनिक जागरण 04 OCT 2022

सीफेट ने स्थापना दिवस मनाया

मखाना उत्पादन व व्यापा...

...ने का बीज तैयार करने के बारे में बताया

केवीके/सीफेट द्वारा मधुमक्खी पालन पर तीन दिवसीय प्रशिक्षण शुरू

दुधारू पशुओं में बांझ... पर तीन दिवसीय प्रशिक्षण कार्यक्रम का समापन

अबोहर, 29 जनवरी (कथूरिया) : कृषि विज्ञान केंद्र सीफेट अबोहर द्वारा दुधारू पशुओं में बांझपन प्रबंधन पर तीन दिवसीय प्रशिक्षण कार्यक्रम 27-29 जनवरी को करवाया गया। मत्स्य पालन, पशुपालन एवं डेयरी मंत्रालय द्वारा प्रायोजित इस कार्यक्रम का संचालन केंद्र के प्रभारी डाक्टर रमेश कुमार के निर्देशन में गृह विज्ञान विशेषज्ञ डाक्टर रूपेंद्र कौर द्वारा किया गया जिसमें 61 (महिला व पुरुष) प्रतिभागियों ने भाग लिया। इस कार्यक्रम में पशुपालन की उन्नत तकनीकों की जानकारी के साथ-साथ विटामिन, खनिज लवण की पशु आहार में भूमिका, पशु ... उनकी रोकथाम, समय-समय पर ... वाला पशुओं का टीकाकरण, ... आवास घर पर पशुओं की चूरी तैया... करने की विधि व अनुपात ... विस्तारपूर्वक जानकारी दी गई ... पशुओं की देखभाल व दूध उत्पाद... की मात्रा अच्छी रहने के ... जानकारी दी गई। इस प्रशिक्षण ... पशुओं से मानव में होने वाल... संक्रमित बीमारियों के बारे में भी ... करते हुए उसके रोकथाम के उपाय ... के बारे में उचित तरीके बताए गए ... इस प्रशिक्षण में प्रतिभागियों ... सर्टिफिकेट भी वितरित किए गए।

मधुमक्खी पालन पर तीन दिवसीय प्रशिक्षण कार्यक्रम संपन्न

सीफेट प्रभारी डा. रमेश कुमार एक प्रतिभागी को सर्टीफिकेट देकर सम्मानित करते हुए।

अबोहर (कथूरिया) : कृषि विज्ञान केंद्र/सीफेट अबोहर द्वारा मधुमक्खी पालन पर तीन दिवसीय प्रशिक्षण 21 से 23 फरवरी को करवाया गया। कार्यक्रम का संचालन केवीके के प्रभारी ... कुमार के निर्देशन में सहायक मुख्य तकनीकी अधिकारी ... द्वारा किया गया। इस कार्यक्रम में मधुमक्खी पालन शुरू ... संबंधित जानकारी के साथ-साथ मधुमक्खियों के चुनाव ... प्रजातियां एवं मधुमक्खियों में होने वाली विभिन्न बीमा...

ਨਵੀਆਂ ਤਕਨੀਕਾਂ ਬਾਰੇ ਕੀਤੀ ਚਰਚਾ

सकाळ अॅग्रोवन — शनिवार, ५ फेब्रुवारी २०२२

धान्य साठवणुकीचे सुधारित तंत्र

ਭਾਰਤੀ ਖੇਤੀ ਖੋਜ ਪ੍ਰਸ਼ਿਦ ਸੰਸਥਾ ਸੀਫ਼ੇਟ ਨੇ ਉਭਰਦੀ ਉਦਮੀ ਨਾਲ ਸਹਿਮਤੀ ਦਸਤਾਵੇਜ਼ 'ਤੇ ਕੀਤੇ ਦਸਤਖ਼ਤ

किसानों के लिए तीन दिनी प्रशिक्षण आज से

हायाघाट. कौशल विकास प्रशिक्षण कार्यक्रम के तहत आगामी 10 फरवरी से आनन्दपुर में तीन दिवसीय प्रशिक्षण आरंभ होगा. जानकारी देते हुए व्यवस्थापक छोटू शर्मा ने बताया कि कृषि उपज का फसलोत्तर प्रसंस्करण के लिए लुधियाना से आयी वैज्ञानिकों की टीम के द्वारा प्रशिक्षण दिया जायेगा. प्रशिक्षण में मखाना की खेती व उनके व्यापार के संबंध में जानकारी दी जायेगी.

शनिवार SATURDAY, 26 फरवरी 2022

सीफेट के वैज्ञानिकों व मुम्बई के ... की टीम ने मिलकर विकसित की ...

ਗੁੜ ਤੇ ਸ਼ੱਕਰ ਗੁਣਵੱਤਾ ਭਰਪੂਰ ਉਤਪਾਦ

ರೈತರ ಕೌಶಲ್ಯಾಭಿವೃದ್ಧಿ ತರಬೇತಿಗೆ ಚಾಲನೆ

अन्नप्रक्रिया उद्योगासाठी विविध यंत्र

सीफेट को पुरस्कार से किया सम्मानित

केंचुआ खाद बनाने पर प्रशिक्षण कार्यक्रम

प्रशिक्षण कार्यक्रम में शामिल सीफेट-कृषि विज्ञान केंद्र के अधिकारी व किसान।

महिला दिवस पर गोष्ठी करवाई

कृषि विज्ञान केंद्र सीफेट में भाग लेते अधिकारी व गांववासी।

अबोहर (कथूरिया): कृषि विज्ञान केंद्र/सीफेट में अंतरराष्ट्रीय महिला दिवस पर गोष्ठी का आयोजन किया गया। कार्यक्रम का संचालन केंद्र के प्रभारी डॉ रमेश कुमार की अगुवाई में गृह विज्ञान विशेषज्ञ डॉ रूपेंद्र कौर द्वारा किया गया। इस कार्यक्रम में कृषि विज्ञान केंद्र की महिला सशक्तिकरण में भागीदारी के रूप ... कृषक महिलाओं के लिए करवाए जाने वाले विभिन्न प्रशिक्षण कार्यक्रमों ... जानकारी डॉ रमेश कुमार द्वारा दी गई। डॉक्टर रूपेंद्र कौर द्वारा म... सशक्तिकरण में स्वयं सहायता समूह की भूमिका पर प्रकाश डालते हुए महि... को स्वयं सहायता समूह बनाकर सशक्त होने की प्रेरणा दी गई। डॉ विनोद ... सहारण द्वारा महिलाओं के लिए सरकार द्वारा चलाई जाने वाली ... योजनाओं के बारे में जानकारी दी गई। पृथ्वीराज द्वारा महिलाओं का ... दिवस पर संस्थान में पधारने के लिए धन्यवाद ज्ञापित किया गया। इस ... में कुल 20 महिलाओं ने अपनी भागीदारी ली तथा बहावलवासी निवा... कौर द्वारा धान की पराली के उपयोग से नर्सरी की पौधशाला व केंचुआ ... करने का अपना अनुभव सांझा किया गया।

, 09 March 2022
...per.dainiksaveratimes.org/c/...

फाजिल्का-अबोहर सवेरा

केवीके सीफेट में सैकड़ों किसानों ने देखा पीएम का वर्चुअल प्रसारण

किसानों में खुशी की लहर, बोले ऐसा दूरदर्शी प्रधानमंत्री पहले कभी नहीं देखा

सीफेट को राजभाषा पुरस्कार से किया सम्मानित

09.03.2022 ಬುಧವಾರ
vishwavani.news

सूअर पालन व निर्यात संभावनाओं पर प्रशिक्षण कार्यक्रम संपन्न

प्रशिक्षण देते सीफेट अधिकारी।

अबोहर, (कथूरिया): कृषि विज्ञान केंद्र/सीफेट अबोहर द्वारा वाणिज्यिक स्तर पर सूअर पालन एवं निर्यात संभावनाओं पर तीन दिवसीय प्रशिक्षण 24 से 26 फरवरी को डा. रमेश कुमार प्रभारी कृषि विज्ञान केंद्र के निर्देशन में डा. रुपेंद्र कौर एवं डा. योगेश कुमार द्वारा किया गया। इस प्रशिक्षण में कुल 32 प्रतिभागियों ने भाग लिया। इस कार्यक्रम में केंद्र के प्रभारी डा. रमेश कुमार द्वारा सूअर पालन से आर्थिक लाभ कमाने की विभिन्न तकनीकों के बारे में प्रतिभागियों को प्रोत्साहित करते हुए प्रशिक्षण का आरंभ किया। डॉ रुपेंद्र कौर द्वारा सूअर पालन में अंतरराष्ट्रीय विपणन की विभिन्न संभावनाओं के बारे में जानकारी दी। इस कार्यक्रम में सूअर पालन की विभिन्न तकनीकों जैसे शेड का निर्माण, आहार, नस्ल का चयन, बीमारियों में रखरखाव एवं उपचार के बारे में जानकारियां दी गई. डॉ योगेश कुमार ... वैज्ञानिक सीफेट लुधियाना ने मीट प्रसंस्करण द्वारा रोजगार के अवसर तथा सीफेट लुधियाना द्वारा दिए जाने वाले मीट प्रसंस्करण पर व्यवसायिक प्रशिक्षण के बारे में विस्तारपूर्वक बताया। डा. विनोद कुमार सहारण ने सूअर पालन से संबंधित योजनाओं एवं किसानों के लिए अन्य सरकारी योजनाओं के बारे में भी जानकारी दी। प्रशिक्षण के अंत में प्रतिभागियों को सर्टिफिकेट भी वितरित किए गए।

सवेरा Sun, 27 February 2022

...जा सकेगा दूर, सीफेट ने तैयार ...

लुधियाना भास्कर 6/3/22

आईसीएआर-सीफेट ने इंडस्ट्री व इंस्टीट्यूट के सहयोग...

गेहूं, चावल की उपज माइक्र... छिड़काव से 12...

ਕੌਮਾਂਤਰੀ ਯੋਗ ਦਿਵਸ ਮਨਾਇਆ

ವಿಜಯವಾಣಿ
ಮೈಸೂರು ಲೋಕಲ್ ಎಕ್ಸ್‌ಪ್ರೆಸ್

...ਲਾਇਸੈਂਸ ਸਰਟੀਫਿਕੇਟ ਕੀਤਾ ਪ੍ਰਦਾਨ

शनिवार SATURDAY, 26 फरवरी 2022

सीफेट के वैज्ञानिकों व मुम्बई के ... टीम ने मिलकर विकसित की मा...

गेहूं, चावल व दालों को एक वर्ष तक बिना कीटनाशक रखा जा सकता है सुरक्षित

गिदड़ांवाली में मछली पालन जागरूकता कैंप लगाया

अबोहर (धर्मवीर) : कृषि विकास केंद्र व सीफेट की ओर से एक दिवसीय मछली पालन जागरूकता कैंप गांव गिदड़ांवाली में आयोजित किया गया। कार्यक्रम में डॉ विनोद सहारण ने सभी किसानों का स्वागत करते हुए केवीके की गतिविधियों के बारे में विस्तृत जानकारी दी और उन्होंने कहा कि जलस्तर बढ़ने के कारण इस क्षेत्र में मछली पालन व अन्य सहायक धंधों के बारे में जानकारी किसानों को होना जरूरी है और लोगों को मछली पालन का धंधा अपनाना चाहिए। इस मौके पर जिला मछली अधिकारी कौकम कौर व मछली पालक अधिकारी सुप्रिया ने भाग लिया। डा. कौकम कौर ने विभाग द्वारा दी जाने वाली सबसिडी के बारे में जानकारी दी और तालाब खुदाई, बीज उपलब्ध करवाना, मछलियों को लाने व ले जाने हेतु परिवहन पर मिलने वाली सबसिडी के बारे में विस्तार से बताया और विभाग द्वारा पांच दिवसीय प्रशिक्षण लेकर मछली पालन करने हेतु बताया। इस क्षेत्र में जलस्तर ऊपर आने के कारण खारे पानी की झींगा मछली पालन अपनाकर अपनी आय बढ़ाने पर बल दिया।

किसानों को जानकारी प्रदान करते हुए विभागीय अधिकारी।

ਸੀਫੇਟ ਵੱਲੋਂ ਨਵਨੂਰ ਨਾਲ ਸਮਝੌਤਾ

'ਆਜ਼ਾਦੀ ਕਾ ਅੰਮ੍ਰਿਤ ਮਹੋਤਸਵ' ਤਹਿਤ ਵੈਬੀਨਾਰ

सिफेट का उभरती उद्यमी के संग करार

जास , लुधियाना : आइसीएआर सेंट्रल इंस्टीट्यूट ... हार्वेस्ट ... (सिफेट) ... ट्रेनिंग लेगी। वह मौजूदा समय में जैगरकेन स्टार्टअप की संस्थापक और सीईओ है। वह बिना रसायन गुड व शक्कर से गुणवत्ता से भरपूर उत्पाद तैयार कर रही है। जिसमें सूखे मेवों का प्रयोग किया जाता है। सिफेट के निदेशक डा नचिकेत ने कहा कि गुड उद्योग भारत मे सबसे पुराना व देहाती उद्योग है, जो कि आज भी बड़े स्तर पर गैर समठित रूप में कार्य कर रहा है। ऐसे उद्यमियों की पहल से इस उद्योग को नई दिशा मिल सकती है।

... किए जाने के बाद सिफेट के ... डा. रणजीत सिंह, डा. डीपन यादव, ... शर्मा • विज्ञप्ति

लुधियाना | आईसीएआर- सीफेट और महिला एंटरप्रेन्योर नवनूर ... हस्ताक्षर किए गए। गिरियों के रोस्ट और पीसने की तकनीक ... गए। नवनूर कौर जैगर कैन की फाउंडर सीईओ हैं। ... की रोस्टिंग और ग्राइंडिंग करने के लिए तकनीक तैयार ... कि गुड़ का इस्तेमाल कर वो उत्पाद तैयार कर सकें। ...

ਸੀਫੇਟ ਨੇ ਅਨੁਸੂਚਿਤ ਜਾਤੀ ਪਰਿਵਾਰਾਂ ਲਈ 3 ਦਿਨਾ ਕੌਸ਼ਲ ਵਿਕਾਸ ਸਿਖਲਾਈ ਕੈਂਪ ਲਗਾਇਆ

হোর্তিকলচর ক্রোপ প্রোসেসিং অমসুং ভেল্যু এদিসনগী ত্রেনিং পাঙথোকখ্রে

उत्पन्नवाढीसाठी कृषी अन्नप्रक्रिया गरजेची

सीफेट में कृषि प्रसंस्करण तकनीकी प्रदर्शन व आदान वितरण कैंप का आयोजन

किसानों को आदान प्रदान करते हुए सीफेट के प्रभारी डा. रमेश कुमार।

अबोहर, (कथूरिया) : सीफेट अबोहर में 8 अप्रैल व 11 अप्रैल को फाजिल्का जिले के किसानों के लिए अनुसूचित जाति उप योजना के अंतर्गत कृषि प्रसंस्करण तकनीकी एवं आदान वितरण कैंप का आयोजन डा. रमेश कुमार प्रभारी सीफेट एवं प्रधान वैज्ञानिक सीफेट अबोहर द्वारा किया गया। इस कैंप के दौरान सरकार द्वारा चलाई जाने वाली अनुसूचित जाति उप योजना की संपूर्ण जानकारी किसानों को दी गई। सीफेट अबोहर केंद्र पर उपलब्ध विभिन्न तरह की कृषि प्रसंस्करण से संबंधित मशीनों के बारे में भी किसानों को अवगत कराया गया। केंद्र का भ्रमण भी किसानों को करवाया गया ताकि वे विभिन्न प्रसंस्करण तकनीकों के बारे में जानकारी हासिल कर सकें। इस अवसर पर अनुसूचित जाति के लगभग 100 बीपीएल किसानों को आर्थिक लाभ के तौर पर कुछ आदान जैसे स्प्रे की टंकी, प्लास्टिक क्रेट व यूरिया खाद का भी निशुल्क वितरण किया गया ताकि कृषि पैदावार पर आने वाले खर्च को कम किया जा सके।

दैनिक सवेरा Tue, 12 April 2022 epaper.dainiksaveratimes.org/c/6

कृषि उपज का फसलोत्तर प्रबंधन की जानकारी को प्रशिक्षण आरंभ

हाजीपुर. कौशल विकास प्रशिक्षण कार्यक्रम के तहत गुरुवार को आनन्दपुर में किसानों के लिये ... आयोजन किया गया. कार्यक्रम का उद्घाटन प्रधान वैज्ञानिक डॉ आरके विश्वकर्मा, समस्तीपुर के सांसद प्रिंस राज व एमआरएस ... किया. मौके पर प्रधान वैज्ञानिक डॉ विश्वकर्मा ने कृषि उपज का फसलोत्तर प्रबंधन विषय पर अपना ... वहीं बिहार हेल्दी फूड प्राइवेट लिमिटेड की ओर से आये ... अभियांत्रिकी एवं प्रौद्योगिकी के बारे में बताया. उपज का ... आये वैज्ञानिकों की टीम ने 60 किसानों को प्रशिक्षण दिया. ... संबंध में जानकारी दी जायेगी. इस मौके पर डॉ विद्यानाथ ... ज, राजेश चौधरी, विपिन गुप्ता आदि मौजूद थे.

The People's Chronicle

Training on horticulture crop held

CHRONICLE NEWS SERVICE

IMPHAL: Indian Council of Agriculture Research (ICAR) – Central Institute of Post-harvest Engineering and Technology along with CAU, Lamphelpat organised a three-da... programme on horticulture crops ... and value addition under Schedul... Plan (SCSP).

The training programme held fr... was attended by 50 farmers and e... from different parts of Kakchin...

The participants were trained on processing and value addition of tree beans (yongchak), ginger, lemon, mushroom and olive fruits. Knowledge on making of jams, pickles, juice and drying of tree beans was also imparted to the trainees, who were then provided training ... hand tools and certificates. ... Dr K Bembem, Dr Th ... Technol-

राष्ट्रीय ... मसाला खे... मंडी जरूरी

पत्रिका न्यूज नेटवर्क

बुरहानपुर. शहर में मसालों की मंडी स्थापित करना हमारी प्राथमिकता है। मसाला खेती के प्रोत्साहन के लिए बेहतर बीज, बेहतर तकनीक व मसाला मंडी जरूरी है। यह बात पूर्व मंत्री अर्चना चिटनीस ने कही। ... इंदिरा कॉलोनी स्थित ... शोविंदजीवाला ऑडिटोरियम में दो दिवसीय राष्ट्रीय स्तर की कार्यशाला का सोमवार को ... समापन हुआ। पूर्व मंत्री ने कहा कि मुख्यमंत्री ने भी फसलों के विविधीकरण का बुरहानपुर मॉडल पूरे प्रदेश में लागू करने की बात कही है। निश्चित रूप से इस कार्यशाला ने हमारे किसान भाइयों के मनोबल को बढ़ाया है।

कार्यक्रम में मौजूद किसान।

ਉਪਰਾਲਾ | ਬਾਜਰੇ 'ਤੇ ਆਧਾਰਤ ਭੋਜਨ ਉਤਪਾਦਾਂ ਸਬੰਧੀ ਇਕ ਰੋਜ਼ਾ ਵਰਕਸ਼ਾਪ

ਰੋਜ਼ਾਨਾ ਖੁਰਾਕ 'ਚ ਬਾਜਰੇ ਦੀ ਮਹੱਤਤਾ ਦੱਸੀ

ਪਲਵਿੰਦਰ ਸਿੰਘ ਢੁੱਡੀਕੇ, ਲੁਧਿਆਣਾ

ਵਰਕਸ਼ਾਪ ਦੀ ਸਮਾਪਤੀ ਮੌਕੇ ਡਾ. ਨਚਿਕੇਤ ਕੋਤਵਾਲੀਵਾਲੇ, ਡਾਇਰੈਕਟਰ ਆਈਸੀਏਆਰ-ਸੀਫੇਟ ਨਾਲ ਆਂਗਨਵਾੜੀ ਵਰਕਰ ਤੇ ਹੋਰ।


सीफेट ने गांवों में कौशल विकास प्रशिक्षण कार्यक्रम कराया
सीफेट का पोषण अभियान एवं वृक्षारोपण कार्यक्रम आयोजित
अमृत महोत्सव के तहत सीफेट में कोविड वैक्सीनेशन कैंप लगाया
पंजाब केसरी
MON,28 FEBRUARY 2022
EDITION: LUDHIANA KESARI, PAGE NO. 10
अनुसूचित जाति के परिवारों के कौशल विकास प्रशिक्षण कैंप
सीफेट के वैज्ञानिक महिला प्रतिभागियों को ट्रेनिंग देते हुए।
ਮਾਈਕ੍ਰੋਬਾਈਲ ਵਿਧੀ 'ਤੇ ਤਕਨਾਲੋਜੀ ਦਾ ਤਬਾਦਲਾ
ਪਲਵਿੰਦਰ ਸਿੰਘ ਢੁੱਡੀਕੇ, ਲੁਧਿਆਣਾ
न्यूज गैलरी
दो दिवसीय प्रशिक्षण आयोजित
आंगनवाड़ी कार्यकर्ता को प्रशिक्षण पत्र देते हुए केन्द्र के संचालक।
कृषि विज्ञान केंद्र सीफेट में किसान मेले का आयोजन
किसानों को बताए गुलाबी सूंडी से बचाव के नुस्खे
संबोधित करते हुए डाक्टर मनप्रीत सिंह।
ਆਈਸੀਏਆਰ-ਸੀਫੇਟ ਨੇ ਲਾਇਆ ਟੀਕਾਕਰਨ ਕੈਂਪ
ਪਲਵਿੰਦਰ ਸਿੰਘ ਢੁੱਡੀਕੇ, ਲੁਧਿਆਣਾ
अमरपुरा व कुलार में सरसों पर फसल दिवस का आयोजन
जाच्छ में बागबानों ने बनाए फल उत्पाद
महत्वपूर्ण सम्मेलन के सामपन पर पहुंचे उद्यान विभाग निदेशक डा. पुर्थी
हिन्दुस्तान
मखाना मूल्य संबंद्धित उत्पाद आज की जरूरत
किसानों को दी गई जानकारी
जागरण
मिथिला की आर्थिक उन्नति का माध्यम बनेगा मखाना : विधायक
मखाना अनुसंधान केंद्र में बैठक सह प्रशिक्षण शिविर आयोजित
राकेश पठानिया बोले, किसानों-बागबानों को आर्थिक रूप से मजबूत बनाने के लिए प्रदेश सरकार कृतसंकल्प
नूरपुर में बागबानी कार्यों पर खर्च किए 12 करोड़
आधुनिक तरीके से करें बागबानी
फलों-सब्जियों के रखरखाव पर दिए टिप्स
Three-day horticulture training workshop begins at Nurpur
The Tribune
भारतीय कृषि अनुसंधान परिषद
Indian Council of Agricultural Research
किसान आधुनिक तकनीक से कृषि के तरीके अपनाएं
वन मंत्री राकेश पठानिया ने कौशल विकास प्रशिक्षण का किया शुभारंभ

जाच्छ में बागबानों ने बनाए फल उत्पाद

आईसीएआर-सीफेट ने 34वें स्थापना दिवस पर किसान मेला लगाया

कृषि उत्पादों की प्रोसेसिंग कर मुनाफा कमाने के लिए काम करें किसान, मछली पालन में भी मौका

ਸੀਫੇਟ ਵੱਲੋਂ ਉਦਯੋਗ ਇੰਟਰਫੇਸ ਅਤੇ ਕਿਸਾਨ ਮੇਲਾ 3 ਅਕਤੂਬਰ ਨੂੰ

ਸੀਫੇਟ ਦੇ ਵਿਗਿਆਨੀਆਂ ਨੇ ਤਿਆਰ ਕੀਤੀ ਅਰਬੀ ਛਿੱਲਣ ਵਾਲੀ ਮਸ਼ੀਨ

ਕਿਸਾਨ ਮੇਲਾ ਲਾ ਕੇ ਸੀਫੇਟ ਨੇ ਮਨਾਇਆ 34ਵਾਂ ਸਥਾਪਨਾ ਦਿਵਸ

सीफेट की ओर से फसल अवशेष प्रबंधन पर कार्यक्रम आयोजित

सीफेट का स्कूल स्तर पर जागरूकता कार्यक्रम करवाया

ਪਰਾਲੀ ਦੀ ਸੰਭਾਲ ਲਈ ਸੀਫ਼ੇਟ ਵਲੋਂ ਪੀ.ਏ.ਯੂ. ਨਾਲ ਮਿਲ ਕੇ ਯਤਨ ਜਾਰੀ-ਕੋਤਵਾਲੀਵਾਲੇ

ਸੀਫ਼ੇਟ ਵਿਖੇ ਉਦਯੋਗ ਇਂਟਰਫੇਸ ਤੇ ਕਿਸਾਨ ਮੇਲਾ 3 ਨੂੰ ਕਰਵਾਉਣ ਦਾ ਐਲਾਨ

Punjab Express 04 OCT 2022

ICAR-CIPHET organises Industry Interface Fair on Agro-Processing and Kisan Mela 2022

PUNJAB EXPRESS BUREAU
Ludhiana, October 3

ICAR-Central Institute of Post-Harvest Engineering and Technology, Ludhiana organised Industry Interface Fair on Agro-Processing and Kisan Mela – 2022 on Monday to celebrate its 34th Foundation Day.

The event was inaugurated by Dr Inderjeet Singh, Vice Chancellor, Guru Angad Dev Veterinary and Animal Science University (GADVASU), Ludhiana. He urged the farmers of Punjab to diversify their agricultural system by including other crops such as maize, millets and also to incorporate value addition into their production system.

Jai Singh, Former OSD, ICAR-CIPHET along with Dr A K Thakur, ADG (PE), ICAR, New Delhi were also present during the inauguration ceremony. Dr Jai Singh expressed his views about the institute and ways forward. He suggested the farmers focus on primary processing along with production enhancement to increase their income.

Dr Thakur appealed to the farmers and entrepreneurs to connect with the institute for taking benefits from the developed technologies.

सीफेट के ... पर किसान

फसल अवशेष प्रबंधन परियोजना के तहत कालेज स्तर का जागरूकता कार्यक्रम का आयोजन

सीफेट की ओर से फसल अवशेष प्रबंधन पर कार्यक्रम आयोजित

ਸੀਫੇਟ ਦਾ 34ਵਾਂ ਸਥਾਪਨਾ ਦਿਵਸ ... ਤਕਨੀਕ ਨਾਲ ਲੈਸ ਕਿਸਾਨ ਮੇਲੇ ਦਾ ਆਯੋਜਨ 3 ਨੂੰ

दैनिक भास्कर 04 OCT 2022

कुट्टू का आटा बन सकेगा सफेद, बीजों से छिलका निकालने वाली मशीन तैयार, एक प्रोसेस में 67% छिलका होगा अलग

24 घंटे में खेती में डी-कम्पोज होगा ... प्रोजैक्ट पर चल रहा काम, जल्दी शुरू

• स्थापना दिवस पर तीन अक्तूबर को सीफेट करेगा ...

...ने उगाई जाने वाली फसलें ... महीने उगाकर किसान कमाएं मुना...

IT. Ludhiana Live 04 OCT 2022

Visitors at one of the exhibition stalls set up at the Kisan Mela at the Central Institute of Post-Harvest Engineering and Technology centre in Ludhiana on Monday.

ICAR hosts Kisan Mela to ensure wider outreach of latest tech

HT Correspondent

LUDHIANA: The Indian Council of Agricultural Research's Central Institute of Post-Harvest Engineering and Technology (ICAR-CIPHET) organised an industry interface fair on agro-processing along with a Kisan Mela on Monday at its premise.

The event, aimed at showcasing new technologies to various stakeholders including industry, entrepreneurs, farmers and students for wider outreach, coincided with the institute's 34th Foundation Day.

ICAR-CIPHET director Dr Nachiket Kotwaliwale briefed the attendees on activities held at IIFA and Kisan Mela 2022.

Live demonstrations of different technologies including machines, plastics structures were provided to visitors at more than 40 stalls, along with display and sale of different value added products like vegan dairy analogues, gluten free bakery products, extruded snacks and some innovative products based on millets among others.

Farmers and other stakeholders are also expected to be briefed about various post-harvest technologies at the event.

All India Coordinated Research Project on Plastic Engineering in Agriculture Structure and Environment Management project coordinator Dr RK Singh gave a demonstration on crops under the protected cultivation and stated that with this technique the crop produces 3-4 times higher yield than that of normal practice of open cultivation.

The fair was open to the visitors from 10 am to 5.30 pm, with farmers from Punjab and neighbouring states also visiting the mela.

The event was inaugurated by Guru Angad Dev Veterinary and Animal Science University (GADVASU) vice-chancellor Inderjeet Singh, who urged the farmers of Punjab to diversify their agricultural system by including other crops such as maize, millets and also to incorporate value addition into their production system.

Former OSD of ICAR-CIPHET, Jai Singh, along with ICAR ADG (PE) AK Thakur were also present during the inauguration ceremony.

The former suggested the farmers to focus on primary processing along with production enhancement to increase their income, while the latter appealed to the farmers and entrepreneurs to connect with the institute for taking benefits from the developed technologies.

भाकृअनुप – सीफेट
ICAR–CIPHET
भाकृअनुप
ICAR
भाकृअनुप-सीफेट
ICAR-CIPHET

Produce | Process | Prosper

ICAR-CIPHET

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लुधियाना–141004 (पंजाब), भारत

ICAR-Central Institute of Post-Harvest Engineeringand Technology
Ludhiana-141004 (Punjab), India
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