



आईसीएआर-सिरकॉट वार्षिक प्रतिवेदन 2025

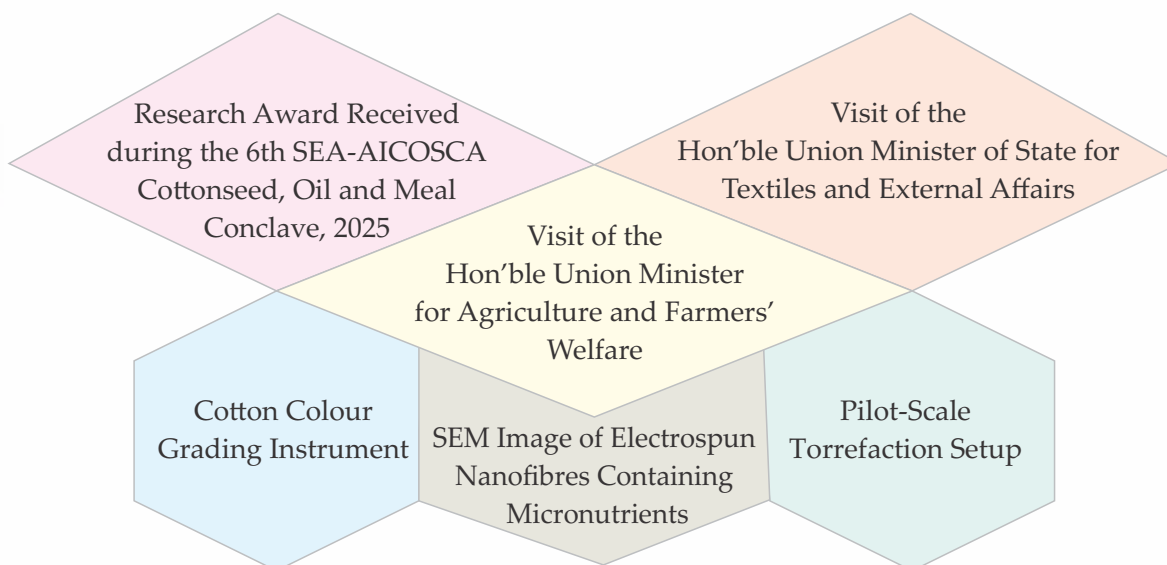
ICAR-CIRCOT ANNUAL REPORT 2025



भा.कृ.अनु.प. - केंद्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान, मुंबई
ICAR-Central Institute for Research on Cotton Technology, Mumbai

Towards Doubling Farmer's Income through Sustainable Processing Technology & Value Addition to by-produce

www.circot.icar.gov.in



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ABBREVIATIONS

ABI	Agri-Business Incubation
AFIS	Advanced Fibre Information System
AFM	Atomic Force Microscopy
AICRP	All India Coordinated Research Project
AKMU	Agricultural Knowledge Management Unit
ASRB	Agricultural Scientists Recruitment Board
ASTM	American Society for Testing and Materials International
BCI	Better Cotton Initiative
BIS	Bureau of Indian Standards
BNPM	Bank Note Paper Mill
CBPD	Chemical & Biochemical Processing Division
CIRCOT	Central Institute for Research on Cotton Technology
CTRL	Cotton Technological Research Laboratory
DR Gin	Double Roller Gin
ETTD	Engineering Technology Transfer Division
FTIR	Fourier Transform Infrared Spectroscopy
GTC	Ginning Training Centre
HDPS	High Density Planting System
HVI	High Volume Instrument
ICAR	Indian Council of Agricultural Research
ICCC	Indian Central Cotton Committee
ICT	Institute of Chemical Technology
IDY	International Day of Yoga
IFS	Indian Fibre Society
IIT-BHU	Indian Institute of Technology- Banaras Hindu University
IJSC	Institute Joint Staff Council
IMC	Institute Management Committee
IP	Indian Pharmacopoeia
IRC	Institute Research Council
ISAE	Indian Society of Agricultural Engineers
ISCI	Indian Society for Cotton Improvement
ISO	International Organization for Standardization
ITMF	International Textile Manufacturers Federation
ITMU	Institute Technology Management Unit
VKSA	Viksit Krishi Sankalp Abhiyan
KVIC	Khadi And Village Industries Commission
MFC	Micro Fibrillated Cellulose
MGMG	Mera Gaon Mera Gaurav
MoU	Memorandum of Understanding
MPD	Mechanical Processing Division
NABL	National Accreditation Board for Testing and Calibration of Laboratories
NAIF	National Agriculture Innovation Fund
NRCG	National Research Centre for Grapes
PMC	Project Monitoring and Evaluation Committee
PM-KISAN	Pradhan Mantri Kisan Samman Nidhi
PMDDKY	Pradhan Mantri Dhan-Dhaanya Krishi Yojana
QEID	Quality Evaluation and Improvement Division
QRT	Quinquennial Review Team
R&D	Research and Development
RAC	Research Advisory Committee
RAFTAAR	Remunerative Approaches for Agriculture and Allied Sector Rejuvenation
RKVY	Rashtriya Krishi Vikas Yojana
RPM	Revolutions per minute
SEM	Scanning Electron Microscopy
TAP	Technical Assistance Programme
TEXPROCIL	The Cotton Textiles Export Promotion Council
USDA	United States Department of Agriculture

प्रस्तावना



कपास सेक्टर भारत की अर्थव्यवस्था में सकल मूल्य वृद्धि और बहुमूल्य विदेशी मुद्रा की कमाई के ज़रिए महत्वपूर्ण योगदान दे रहा है। इसके साथ ही, यह लगभग 60 लाख किसानों की आजीविका का सहारा है और कपास मूल्यश्रृंखला के जरिए 4 से 5 करोड़ से ज़्यादा लोगों को रोज़गार देता है। भारत सरकार ने वर्ष 2025 में 'कपास प्रोडक्टिविटी मिशन' शुरू किया है। इसका उद्देश्य कपास किसानों को वैज्ञानिक और तकनीकी सहायता देना है। यह मिशन सरकार के '5F विज़न' - 'फार्म टू फाइबर' (खेत से रेशा), 'फाइबर टू फैक्ट्री' (रेशे से फैक्ट्री), 'फैक्ट्री टू फैशन' (फैक्ट्री से फैशन), 'फैशन टू फॉरेन' (फैशन से विदेश) - के अनुरूप है, ताकि इस सेक्टर में बड़ा बदलाव लाया जा सके।

भा.कृ.अनु.प.- केंद्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान (सिरकॉट), ने कपास सेक्टर में इस पहल में अहम भूमिका निभाई है। यह संस्थान कपास चुनाई की मशीनरी को बेहतर बनाने और मशीन से चुने गए कपास की जिनिंग (बीज अलग करने) के लिए उचित प्रणाली विकसित करने के काम से जुड़ा है। संस्थान 'कस्तूरी कपास भारत' पहल को मजबूत करने के लिए TEXPROCIL के साथ मिलकर काम कर रहा है और मौजूदा डिजिटल पहलों के साथ-साथ फिजिकल ट्रेसेबिलिटी सॉल्यूशन विकसित करने में भी सहयोग कर रहा है।

रिसर्च के क्षेत्र में, संस्थान ने जिनिंग प्रतिशतता का पता लगाने के लिए स्टैंडर्ड प्रोसेस प्रोटोकॉल विकसित करने की दिशा में कदम उठाए हैं। संस्थान ने किसानों और मजदूरों के लिए प्रोटेक्टिव टेक्सटाइल्स (सुरक्षात्मक वस्त्र) विकसित किए हैं। भा.कृ.अनु.प.- सिरकॉट, कपास की गुणवत्ता मापने के लिए स्वदेशी पोर्टेबल उपकरण विकसित करने के लिए प्रतिबद्ध है और प्रोटोटाइप कलर ग्रेडिंग (रंगों पर आधारित वर्गीकरण) के लिए उपकरण विकसित किया है। संस्थान कई अन्य क्षेत्रों में भी काम कर रहा है, जैसे कि कपास बेल (गांठ) बनाते समय गंदगी से बचाने के लिए खेत पर ही रुई की बेलिंग, मिश्रित वस्त्र, खेती में इलेक्ट्रोस्प्रेडिंग टेक्नोलॉजी का इस्तेमाल, आवरण के लिए परिष्कृत कपास वस्त्र, और अनुमान लगाने व इंस्ट्रुमेंटेशन में आर्टिफिशियल इंटेलिजेंस तथा मशीन लर्निंग तकनीकों का इस्तेमाल।

भा.कृ.अनु.प.- सिरकॉट, तकनीकें बनाने के साथ-साथ उसके व्यावसायीकरण पर भी ध्यान देता है। इस वर्ष टेक्नोलॉजी लाइसेंसिंग के लिए आठ और टेक्नोलॉजी लाइसेंस का नवीकरण करने के लिए तीन समझौते ज्ञापन पर हस्ताक्षर किए गए,

जो संस्थान में हितधारकों के भरोसे को दिखाते हैं। संस्थान ने इंडस्ट्री से जुड़े हितधारकों के साथ मिलकर कंसल्टेंसी और कॉन्ट्रैक्ट रिसर्च प्रोजेक्ट भी शुरू किए हैं।

संस्थान का एक और अहम काम इस सेक्टर में क्षमता निर्माण (कैपेसिटी बिल्डिंग) का है। किसानों और इंडस्ट्री से जुड़े अन्य हितधारकों के लिए कुल 28 प्रशिक्षण कार्यक्रम आयोजित किए गए, जिनमें लगभग 38% लाभार्थी महिलाएं थीं। एग्री-बिज़नेस इनक्यूबेशन के क्षेत्र में संस्थान की उपलब्धियां सराहनीय हैं, जैसा कि आंकड़ों से पता चलता है: अब तक 192 स्टार्ट-अप्स को इनक्यूबेट किया गया और उनमें से 81 को 12.35 करोड़ रुपये की सहायता अनुदान मंजूर किया गया।

संस्थान ने महाराष्ट्र राज्य में आयोजित 'विकसित कृषि संकल्प अभियान' का हिस्सा बनकर अपनी किसान-केंद्रित गतिविधियों को नई ऊर्जा दी है और महाराष्ट्र के सात जिलों में 585 से ज़्यादा जागरूकता कार्यक्रम चलाए हैं, जिनसे एक लाख से ज़्यादा किसानों को फ़ायदा हुआ है। इसके अलावा, महाराष्ट्र और ओडिशा राज्यों में किसानों के बीच कपास वैल्यू चेन को बढ़ावा देने के लिए कौशल विकास कार्यक्रम भी आयोजित किए गए।

संस्थान ने भगवान बिरसा मुंडा की 150 वीं जयंती के उपलक्ष्य में 'जन-जातीय गौरव वर्ष पखवाड़ा' बहुत धूमधाम से मनाया है। भा.कृ.अनु.प.- सिरकॉट हमेशा से सरकार के कार्यक्रमों, जैसे 'मेरा गांव मेरा गौरव' और 'स्वच्छ भारत अभियान' आदि को लागू करने में सबसे आगे रहा है।

संस्थान आवंटित बजट का 100% इस्तेमाल सुनिश्चित करने के साथ साथ अपनी तकनीकियों व्यावसायीकरण, कंसल्टेंसी, कौशल विकास, रिसर्च उत्पाद की बिक्री और कपास मूल्य श्रृंखला से जुड़े हितधारकों को व्यावसायिक परिक्षण सेवा देकर अब तक का सबसे ज़्यादा राजस्व भी हासिल किया है।

मैं संस्थान की विरासत को आगे बढ़ाने और कपासतकनीकी के क्षेत्र में वैश्विक स्तर पर बेहतरीन मुकाम हासिल करने के लक्ष्य को पूरा करने की दिशा में काम करने वाले सभी कर्मचारी सदस्यों के योगदान की सराहना करता हूँ।

मुंबई

एस. के. शुक्ला
निदेशक

PREFACE



Cotton sector is making significant contribution to the nation in terms of gross value addition and precious foreign exchange earning besides supporting the livelihood of about 6 million farmers and employing over 40-50 million stakeholders in the value chain segment. Government of India has launched the Mission for Cotton Productivity in 2025 that aims to provide scientific and technological support to cotton farmers aligning with its 5F vision – Farm to fibre, fibre to factory, factory to fashion, fashion to foreign, to bring in a major transformation in the sector.

ICAR-Central Institute for Research on Cotton Technology, has played significant role in this initiative in the cotton sector. The institute is associated with the development and refinement of mechanization of cotton harvesting system and development of suitable processing system for ginning of the machine harvested cotton under the mission. The institute is collaborating with the TEXPROCIL in strengthening the Kasturi Cotton Bharat initiative and associating in development of physical traceability solution complementing the present digital initiatives.

On the research front, the institute has forayed into development of standard process protocol for determination of the ginning percentage. Institute has developed the protective textiles for industrial workers as well as the farmers. ICAR-CIRCOT is committed towards development of indigenous portable instruments for cotton quality measurement and has developed the prototype colour grading instrument. The institute is also exploring the development of on-farm baling of raw cotton to avoid contamination during bale formation, blended textiles, electrospinning technology for agricultural application, functionally finished cotton textiles for packaging, use of AI/ML techniques in prediction and instrumentation.

ICAR-CIRCOT besides generation of the technology, also focuses on commercialization. During the year eight MoU's were signed for technology licensing and three MoU's for renewal of the technology license reiterating the stakeholders trust in the institute. The institute has also initiated consultancy and contract research projects in collaboration with the industrial stakeholders.

The Institute also has another important task of capacity building in the sector. Total 28 training programmes were organised for farmers and other industrial stakeholders wherein around 38% of the beneficiaries are women. The achievements made by the institute in the domain of agri-business incubation is commendable as revealed by the statistics: 192 start-ups were incubated and 81 of them were sanctioned with a grant-in-aid support of 12.35 crore.

The institute has revitalised its farmer centric activities by being a part of the Viksit Krishi Sankalp Abhiyan organised in the state of Maharashtra and conducted over 585 awareness programmes covering seven districts of Maharashtra benefitting more than one lakh farmer. Besides skill development programmes were also organised for the promotion of cotton value chain among the farmers in the state of Maharashtra and Odisha.

The institute has celebrated the Jan Jathiya Gaurav Varsh Pakhwada in a grand manner commemorating the 150th birth anniversary of Bagwan Birsa Munda. ICAR-CIRCOT has always been front runner in implementing the initiatives of the government programme such as MGMP, Swachh Bharat Abhiyan, etc.

The institute exhibits financial prudence by ensuring 100% utilization of the budget allocated, besides generating highest ever internal revenue through its technology commercialization, consultancy, skill development, sale of research products and commercial testing services to the stakeholders in the cotton value chain.

I acknowledge the contribution of all the staff members in taking forward the legacy of the institute and working toward achieving the vision of attaining global excellence in cotton technology.

Mumbai

S.K. Shukla
Director

कार्यकारी सारांश

भा.कृ.अनु.प.-केंद्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान (सिरकॉट), भारतीय कृषि अनुसंधान परिषद (भा.कृ.अनु.प.) के तहत कार्यरत संस्थान है। यह संस्थान कपास की कटाई पश्चात की तकनीकियां और कपास के उप-उत्पादों का मूल्यवर्धन पर बुनियादी और रणनीतिक संशोधन करता है। यह संस्थान कपास के पौधे के हर हिस्से के पूरी तरह से इस्तेमाल के लिए किये गये संशोधन के कारण दुनिया भर में पहचाना जाता है और कपास के रेशे की परिक्षण के लिए एक राष्ट्रीय परामर्शदायी (रेफरल) प्रयोगशाला के तौर पर काम करता है।

यह संस्थान 1966 से देश के कपास ब्रीडिंग प्रोग्राम्स को तकनीकी सहायता दे रहा है और रेशे की गुणवत्ता की जांच पर खास ज़ोर देता है। सिरकॉट, कौशल विकास कार्यक्रम, एग्री-बिज़नेस इनक्यूबेशन सेवाओं और परिक्षण, कंसल्टेंसी व कॉन्ट्रैक्ट रिसर्च जैसी व्यावसायिक सेवाओं के ज़रिए किसानों, उद्यमियों और इंडस्ट्री से जुड़े लोगों की क्षमता बढ़ाने के लिए भी सक्रिय रूप से काम कर रहा है। पिछली एक सदी में, संस्थान ने कपास प्रसंस्करण तकनीकीयों को आगे बढ़ाने और कपास के उप-उत्पादों एवं जैवभार का मूल्यवर्धन को बढ़ावा देने में उल्लेखनीय योगदान दिया है।

यह संस्थान मुख्य रूप से इन 5 क्षेत्रों में अनुसंधान करता है: पूर्व ओटाई एवं ओटाई ; यांत्रिक प्रक्रिया, टेक्निकल टेक्सटाइल्स और कम्पोजिट्स; कपास और अन्य प्राकृतिक रेशों, तंतू और वस्त्र की विशेषताओं की जांच; कपास की रासायनिक और जैव रासायनिक प्रसंस्करण और इसके उप-उत्पादों एवं जैवभार का इस्तेमाल; और उद्यमिता व मानव संसाधन विकास।

अनुसंधान की मुख्य उपलब्धियां (वर्ष 2025):

संस्थान ने तय किए गए क्षेत्रों में अनुसंधान के ज़रिए कपास क्षेत्र में योगदान दिया है, जैसे कि यंत्र-सामग्री, प्रसंस्करण तकनीकें और मूल्यवर्धित उप-उत्पाद विकसित करना; शोध प्रकाशन; और लाइसेंसिंग और बौद्धिक संपदा सुरक्षा के ज़रिए तकनीकियों का व्यावसायीकरण।

वर्ष 2025 के दौरान संस्थान की कुछ खास उपलब्धियां इस प्रकार हैं:

तकनीक/यंत्र/प्रोसेस प्रोटोकॉल/ उत्पाद:

- गुलाब की खेती करने वाले किसानों के लिए कॉटन से बने सुरक्षात्मक दस्ताने

- कपास की रंग पर आधारित वर्गीकरण प्रणाली
- डबल रोलर जिन रोलर्स के लिए स्वयंचलित डीप-ग्रूव फॉर्मिंग मशीन
- कंटीन्यूअस फ्लो कॉटनसीड ड्रायर
- मल्टी-लेयर बुने हुए कट-रेसिस्टेंट औद्योगिकी दस्ताने
- कॉटन/हेम्प के नए मिश्रण
- स्वयंचलित मशीन लर्निंग का इस्तेमाल करके कपास तंतू की मजबूती (टेनेसिटी) की प्रेडिक्टिव मॉडलिंग
- फूलों की पैकेजिंग के लिए नैनो-फिनिशड एंटीमाइक्रोबियल कपास वस्त्र
- जिनरी में लिंट क्लीनर्स के बेहतर परफॉर्मेंस के लिए ऑप्टिमाइज़्ड पैरामीटर और ऑपरेशनल सुझाव
- रूई की जिनिंग प्रतिशत का पता लगाने के लिए स्टैंडर्ड प्रोसेस प्रोटोकॉल
- बेहतर तेल प्राप्ति और अच्छी क्वालिटी की खली के लिए कॉटनसीड प्रोसेसिंग के तरीके में सुधार।

टेक्नोलॉजी रिलीज़ और सर्टिफिकेशन

भा.कृ.अनु.प.-सिरकॉट द्वारा विकसित तीन तकनीकियों को भारतीय कृषि अनुसंधान परिषद ने सर्टिफाई किया। 16 जुलाई, 2025 को भा.कृ.अनु.प.के 97वें स्थापना दि के मौके पर 'कंटीन्यूअस फ्लो कॉटनसीड ड्रायर' टेक्नोलॉजी को रिलीज़ किया गया और इसे एग्रीकल्चरल इंजीनियरिंग विषय प्रभाग की 5 सर्वोत्तम तकनीकियों में शामिल किया गया।

शोध प्रकाशन (रिसर्च पब्लिकेशन)

पीयर-रिव्यूड जर्नल्स में 35 रिसर्च पेपर, 19 कॉन्फ्रेंस पेपर, 05 किताबें, 07 बुक चैप्टर और 60 अन्य पब्लिकेशन (जिनमें पॉपुलर आर्टिकल, ट्रेनिंग मैनुअल, बुकलेट, लीफ़लेट और ई-पब्लिकेशन शामिल हैं) प्रकाशित किए गए।

कौशल विकास कार्यक्रम

- 28 ट्रेनिंग प्रोग्राम आयोजित किए गए, जिनसे 605 प्रशिक्षणार्थियों को लाभ हुआ; इनमें किसान, किसान उत्पादक संगठन, व्यापारी, इंडस्ट्री, रिसर्चर और शिक्षण संस्था के लोग शामिल थे।
- प्रशिक्षणार्थियों में 373 पुरुष और 232 महिला प्रतिभागी शामिल थे। इनमें 36% छात्र, 27% भारतीय कपास निगम के अधिकारी, 20% किसान, 7% इंडस्ट्री से जुड़े

लोग और बाकी भा.कृ.अनु.प. / राज्य कृषि विश्वविद्यालय और सरकारी विभागों के प्रतिनिधि थे।

टेक्नोलॉजी मैनेजमेंट

पेटेंट

- फेस मास्क के कपड़े में पार्टिकल फ़िल्टरेशन को बेहतर बनाने के लिए बुने हुए कपड़े का डिज़ाइन (पेटेंटप्रदान नं : 566951)
- गॉसिपोल एसिटिक एसिड बनाने की प्रक्रिया (एप्लीकेशन नंबर: 202521067478)
- परिष्कृत बुना हुआ वस्त्र और उसे बनाने की प्रक्रिया (एप्लीकेशन नंबर: 20252106821)

कॉपीराइट

- बीज बोने वाले इलेक्ट्रॉनिक मॉड्यूल के लिए एल्गोरिदम (मंजूरी मिली: SW-2025021436)
- BENLiP: न्यूक्लियोसोम और लिंकर की स्थिति का पता लगाने के लिए बैगिंग-आधारित एनसेंबल मॉडल

तकनीकियों का व्यवसायीकरण

- 5 तकनीकियों का व्यवसायीकरण के लिए आठ समझौते पर हस्ताक्षर किए गए।
- इस वर्ष दौरान तीन तकनीकियों के लाइसेंस का नवीकरणकरने के लिए समझौते पर हस्ताक्षर किए गए।

अनुसंधान सहयोग

- संस्थागत और इंडस्ट्री पार्टनर्स के साथ अनुसंधान सहयोग के लिए चार समझौते पर हस्ताक्षर किए गए।
- रिसर्च और शैक्षणिक सहयोग के लिए शेर-ए-कश्मीर यूनिवर्सिटी के साथ एक समझौते पर हस्ताक्षर किए गए।

जागरूकता कार्यक्रम और प्रदर्शनी

- विकसित कृषि संकल्प अभियान (VKSA) के तहत, संस्थान के वैज्ञानिकों की तेरह टीमों ने महाराष्ट्र के सात जिलों में लगभग 585 जागरूकता कार्यक्रम आयोजित किए, जिनसे एक लाख से अधिक किसानों को लाभ हुआ।
- मेरा गांव मेरा गौरव (MGMG) के तहत अपनाये गांवों में पंद्रह जागरूकता कार्यक्रम आयोजित किए गए; अन्य हितधारकों के लिए सात प्रदर्शन-सह-जागरूकता कार्यक्रम आयोजित किए गए। तीन प्रदर्शनियां आयोजित की गईं और संस्थान ने 10 प्रदर्शनियों में भाग लिया और अपनी तकनीकों का प्रदर्शन किया।

वृत्तपत्र / रेडियो / टी. वी. संवाद

- संस्थान की विभिन्न गतिविधियों पर समाचार पत्रों में छब्बीस लेख और विकसित कृषि संकल्प अभियान (VKSA) कार्यक्रम पर लगभग 100 लेख प्रकाशित किए गए।
- इस अवधि के दौरान एक टीवी कार्यक्रम और एक रेडियो वार्ता प्रसारित की गई।

व्यावसायिक सेवाएं

- इस अवधि के दौरान 54,940 नमूनों का व्यावसायिक परिक्षण किया गया। तीन हितधारकों को परामर्श सेवाएं प्रदान की गईं।
- भा.कृ.अनु.प.- सिरकॉट कैलिब्रेशन कॉटन (HVI उपकरणों को कैलिब्रेट करने के लिए USDA कैलिब्रेशन कॉटन के आयात विकल्प के रूप में) – जनवरी से दिसंबर 2025 के दौरान हितधारकों को 157 कंटेनर बेचे गए, जिससे 1,48,365/- रुपये का राजस्व प्राप्त हुआ।

इनक्यूबेशन सेवाएं

- आर.के. वी. वाय- रफ्तार के तहत इनक्यूबेशन, मेंटरिंग और वित्तीय सहायता के लिए कृषि स्टार्ट-अप्स के साथ अठारह समझौता ज्ञापन पर हस्ताक्षर किए गए।
- एग्री-बिजनेस इनक्यूबेशन सेंटर में इस अवधि के दौरान अठारह नए इनक्यूबेटियों को शामिल किया गया और 12 उद्यमियों का इनक्यूबेशन चल रहा है।

वित्तीय प्रबंधन

- संस्थान ने वर्ष 2025-26 के दौरान आवंटित फंड का 100% उपयोग सुनिश्चित किया है।
- वित्तीय वर्ष 2025-26 के दौरान आंतरिक राजस्व सृजन रु. 473.91/- लाख था।

अन्य गतिविधियां

- भगवान बिरसा मुंडा की 150 वीं जयंती के उपलक्ष्य में 'जनजातीय गौरव वर्ष पखवाड़ा' मनाया गया; राष्ट्रीय गीत "वंदे मातरम" के 150 वर्ष पूरे होने का उत्सव मनाया गया; 'स्वच्छ ही सेवा: 'स्वच्छ भारत मिशन' और 'स्वच्छता पखवाड़ा' लागू किया गया; 'विश्व बौद्धिक संपदा दिवस' मनाया गया।
- राष्ट्रीय एकता दिवस, अंतर्राष्ट्रीय योग दिवस, सतर्कता जागरूकता अभियान, संविधान दिवस आदि भी मनाए गए।

Executive Summary

ICAR-Central Institute for Research on Cotton Technology (CIRCOT) is a premier institute under the Indian Council of Agricultural Research (ICAR), mandated to undertake basic and strategic research in post-harvest cotton technology and value addition to cotton by-produce. The Institute is globally recognized for its unique research and development efforts aimed at the comprehensive utilization of every part of the cotton plant and serves as a national referral laboratory for cotton fibre testing.

The Institute has provided technological support to Country's cotton breeding programs since 1966, placing a special emphasis on fibre quality evaluation. ICAR-CIRCOT is also actively committed to strengthening the capabilities of farmers, entrepreneurs, and industry stakeholders through targeted skill development programmes, Agri-Business Incubation services, and commercial services such as testing, consultancy, and contract research. Over the past century, the Institute has made remarkable contributions to advancing cotton processing technologies and promoting value addition to cotton by-produce and biomass.

The Institute undertakes research activities in the following 5 major core areas viz., Pre-ginning and Ginning; Mechanical processing, Technical textiles and Composites; Characterization of Cotton & other natural fibres, yarns and textiles; Chemical & Biochemical processing of cotton and its biomass & by-produce utilization; and Entrepreneurship and Human Resource Development.

Salient Research Achievements (2025):

The institute has contributed to the cotton sector through various research output in the

mandated areas viz., developing machinery, process technology and value-added products; research publications; commercialization of the technology through licensing and intellectual property protection. Some of the salient achievement made by the institute during 2025 are:

Technology / Machinery / Process Protocol / Products

- Cotton-based protective gloves for rose cultivation farmers.
- Cotton colour grading system.
- Automatic Deep-groove forming machine for DR gin rollers.
- Continuous flow cottonseed dryer.
- Industrial multi-layer woven cut-resistant gloves.
- Novel blends of cotton/hemp.
- Predictive Modelling of cotton yarn tenacity using Automated Machine Learning.
- Nano-finished antimicrobial cotton textiles for post-harvest packaging of flowers.
- Optimised Parameter and operational recommendation for efficient performance of lint cleaners in ginneries.
- Standard process protocol for determination of ginning percentage of seed cotton.
- Optimized cottonseed processing protocol for enhanced oil recovery and better cake quality.

Technology Release & Certification

- Three technologies developed by ICAR-CIRCOT was certified by the Council. On

the occasion of the 97th ICAR foundation day on July 16, 2025 the Continuous flow cottonseed dryer technology was released and is recognised among top 5 technologies from the Agricultural Engineering SMD.

Research Publication

- Published 35 research papers in peer reviewed journals, 19 conference papers, 05 books, 07 book chapters, and 60 other publications including, popular articles, training manuals, booklets, leaflets and e-publications.

Skill Development Programme

- Twenty-eight training programmes were organised benefitting 605 stakeholders including, farmers, FPO's, traders, industry, researchers and academia.
- The beneficiaries, comprising 373 male and 232 women participants, is represented by 36% students, 27% CCI officials, 20% farmers, 7% industry and rest representing ICAR/SAU and Government departments. During the year 2025–26, a total revenue of ₹45.39 lakh was generated through various training programmes.

Technology Management

Patent

- Woven fabric architecture for enhanced particle filtration in face mask fabric (Granted: 566951).
- A Process for the Production of Gossypol Acetic Acid (Application number: 202521067478).
- Finished woven fabric and a process for its preparation (Application number: 202521069821).

Copyright

- Algorithm for electronic seed sowing module (Granted: SW-2025021436).
- BENLiP: Bagging-based Ensemble Model to Identify Nucleosome and Linker Positioning.

Commercialization

- Eight MoU's were signed for commercialization of 5 technologies.
- MoU's for renewal of licensing of three technologies were signed during the period.

Collaboration

- Four MoU's signed for research collaboration with institutional and industry partners.
- MoU was signed with Sher-e-Kashmir University for research and academic collaboration.

Awareness Programme and Exhibition

- Under Viksit Krishi Sankalp Abhiyan (VKSA) around 585 awareness programme was organised by thirteen teams of the institute scientists benefitting over one lakh farmers across seven districts of Maharashtra.
- Fifteen awareness programmes were organised in the MGMG villages, Seven demonstrations cum awareness programme were organised for other stakeholders. Three exhibitions were organised and the institute participated & displayed its technologies in 10 exhibitions.

Mass/Social Media

- Twenty-six articles in newspapers on various institutional activities and about 100

articles on the VKSA programme were published.

- One TV programme and one Radio talk was broadcast during the period.

Commercial services

- Commercial testing of 54,940 samples was done during the period. Three consultancy services were provided to the stakeholders.
- ICAR-CIRCOT calibration cotton (an import substitute for USDA calibration cotton) – 157 containers sold to stakeholders generating revenue of Rs. 1,48,365/- during January to December 2025.

Incubation Services

- Eighteen MoA's was signed with agri start-ups for incubation, mentoring and financial support under the RKVY-RAFTAAR framework.
- Eighteen new incubatees are admitted and 12 incubations are in progress during the

period in the Agri-Business Incubation Centre.

Financial Management

- The institute has ensured 100% utilization of the funds allocated during the year 2025-26.
- The internal revenue generation during the financial year 2025-26 is Rs. 473.91 lakh rupees as against the target of Rs. 439 lakhs.

Other activities

- Celebrated the Jan Jatiya Gaurav Varsh Pakhwada commemorating the 150th Birth Anniversary of Bagwan Birsa Munda, commemorated 150 Years of National Song "Vande Mataram", implemented Swachh Hi Sewa: Powering Swachh Bharat Mission and Swachhata Pakhwada, celebrated World Intellectual Property Day.
- Observed the National Unity Day, International yoga day, Vigilance awareness campaign, Constitution Day, etc.

Chapter 1

Introduction

ICAR- CIRCOT was established in 1924 as the *Technological Laboratory* under the Indian Central Cotton Committee (ICCC). The Institute came under the administrative control of Indian Council of Agricultural Research (ICAR) in 1966, following the dissolution of ICCC, and was renamed as *Cotton Technological Research Laboratory (CTRL)*. The laboratory emerged as one of the premier research institutes under Agricultural Engineering SMD of ICAR with a widened research agenda and was renamed as *Central Institute for Research on Cotton Technology (CIRCOT)* in 1991.

The Institute is globally recognized for its unique research and development efforts aimed at the comprehensive utilization of every part of the cotton plant and serves as a national referral laboratory for cotton fibre testing. CIRCOT is also actively committed to strengthening the capabilities of farmers, entrepreneurs, and industry stakeholders through targeted skill development programmes, Agri-Business Incubation services, and commercial services such as testing, consultancy, and contract research.

The Institute is accredited with ISO 9001:2015 for its Quality Management System by Bureau of Indian Standards. The laboratory is NABL accredited (ISO/IEC 17025) for Mechanical and Physical testing for over 44 parameters. Institute is the recipient of Sardar Patel Best ICAR institute award twice, in 2004 and 2019 (under small institute category) for its dedicated service.

In 2025, the institute has set up a Genome

Editing Laboratory at its Mumbai premises. An Institute Biosafety Committee (IBSC) is constituted to oversee and regulate the research activities involving genetically modified organisms (GMOs), recombinant DNA (rDNA), and other biohazardous materials within the Institute, ensuring compliance with the applicable biosafety guidelines and regulatory requirements.

Vision

“Global Excellence in Cotton Technology”

Mission

To provide scientific and managerial interventions to post-harvest processing and value addition to cotton and utilization of its by-produce to maximize economic, environmental and societal benefits

Mandate

1. Basic and Strategic Research on Processing Cotton and its Agro-Residues, Development of Value-Added Products and Quality Assessment.
2. Skill Development and Business Incubation Services and Function as Referral laboratory for Cotton Fibres.

Research Divisions

The primary mandate of ICAR-CIRCOT is to conduct basic and strategic research on cotton processing, by-product utilization, and the development of value-added products. The Institute's research and development activities are organized through four specialized divisions viz., *Quality Evaluation and*

Improvement Division (QEID), Mechanical Processing Division (MPD), Chemical and Biochemical Processing Division (CBPD) and Engineering Technology Transfer Division (ETTD).

There are six regional units viz., *Ginning Training Centre, Nagpur and Quality Evaluation Units located at Coimbatore, Dharwad, Guntur, Surat and Sirsa*. The research divisions along with the regional units facilitate the Institute's core activities, including research, skill development, technology transfer, and commercial services such as testing, consultancy, incubation, and capacity building in the areas of post-harvest cotton processing and value addition to cotton by-products and biomass.

Research Programmes:

The institute structures its research initiatives around five major core thematic areas viz., *Pre-Ginning & Ginning; Mechanical Processing, Technical Textiles & Composites; Characterization of cotton & other natural fibres, yarns and textiles; Chemical & Biochemical Processing and by-product and biomass utilization; Entrepreneurship & Human Resource Development*. Besides these, the institute is involved in other major research programmes.

CIRCOT has made significant contribution to the progress of post-harvest processing of cotton in the country. The ginning sector has immensely benefited from the ginning machinery research and also skill development of its manpower that has enabled the sector to become self-reliant and also emerge as a net exporter of the ginning machinery. The institute is playing an important role in the cotton breeding programme by screening

the cotton genotypes according to the quality parameters that suits the industry needs. The Institute's calibration cotton is an import substitute for the USDA calibration cotton used for calibration of the High-Volume Instruments used in fibre quality assessment.

The Institute has significantly expanded the utilization of cotton through the development of innovative products and technologies, including cotton-rich blended fabrics for sportswear, technical textiles (particularly medical and protective textiles), and naturally coloured cotton products and apparel. It has also made significant advances in nanotechnology, including the development of nanofibre-based micronutrient delivery systems for plants. It has also pioneered eco-friendly chemical processing and finishing technologies, including natural dyeing, salt-free dyeing, eco-friendly mosquito-repellent finishes using natural extracts, and functional finishes such as antimicrobial, UV-protective, and water-repellent treatments.

The Institute has developed solvent extraction and microbial processes for the removal of gossypol from cottonseed meal, enabling its use as non-ruminant feed. Technologies for commercial utilization of cotton biomass such as mushroom cultivation, particle board manufacture, conversion into briquettes and pellets for use as industrial raw material are also developed and promoted by the institute.

Consortia Research Platform (CRP) on Natural Fibers : ICAR-CIRCOT serves as the Lead Institute and Nodal Centre for the implementation of the Consortia Research Platform (CRP) on Natural Fibres project to exploit the available natural fibres and their by-

products by using high-end technologies to fuel the growth of fibre sector in India, this in turn enhances the farm income as a whole.

Additionally newer fibrous raw materials can be identified and isolated for value addition and thereby provide enhanced income to all the stakeholders in the value chain.

Mission on Cotton Productivity: Under this programme launched by the Government of India, the Institute is involved in the research pertaining to promotion of mechanical harvesting of cotton & processing of the mechanically harvested cotton, besides assisting in development of high yielding varieties with desired quality parameters, suiting the demand of the industry.

Kasturi Cotton Bharat Programme: ICAR-CIRCOT is also actively engaged in developing quality standards and benchmarking for Kasturi Cotton, along with establishing a traceability system for Indian cotton to enhance its quality, marketability, and global competitiveness.

Externally Funded Research Programmes: The institute is implementing externally funded research programmes under National Biomass Mission, National Technical Textile Mission (NTTM), National Agricultural Science Fund (NASF), Rashtriya Krishi Vikas Yojana (RKVY), Department of Science and Technology (DST), Rajiv Gandhi Science & Technology Commission (RGSTC) and Bureau of Indian Standards (BIS).

Public Private Partnership : ICAR-CIRCOT has been collaborating closely with the private sector to support research and development initiatives for the design, development, and

commercialization of machinery related to post-harvest cotton processing and value addition to cotton by-products and agro-biomass. In collaboration with industry partners, the Institute has recently developed several innovative technologies, including an on-farm cotton testing system, a high-capacity cotton ginning machine, cottonseed dryer etc. While some of these technologies have already been commercialized, others are at advanced stages of development, contributing to the technological advancement and modernization of the cotton value chain.

Farmer-Centric Research & Development: The Institute has initiated several research and development projects aligned with the Government of India's vision of enhancing farmers' income. These include value addition to cotton stalks through compost production, promotion of mushroom cultivation using cotton biomass, and production of briquettes and pellets from cotton stalks for renewable energy generation. These initiatives provide additional income opportunities for farmers through the efficient utilization of cotton biomass. The Institute is also working on the development and promotion of **GOT-based seed cotton procurement** to improve transparency, quality assurance, and value realization in the cotton marketing system.

ICAR-CIRCOT actively participated in the **Viksit Krishi Sankalp Abhiyan (VKSA)** in Maharashtra covering **seven districts** Akola, Buldhana, Bhandara, Chandrapur, Nagpur, Thane, and Wardha. Through extensive farmer-scientist interactions, field demonstrations, and awareness programmes, the Institute reached approximately **1.10 lakh farmers**, disseminating improved post-harvest

cotton technologies, sustainable agricultural practices, and value-addition technologies to enhance agricultural productivity, profitability, and farmers' income.

Quality Assessment

To enhance the global visibility and market recognition of Indian cotton, the Government of India launched the Kasturi Cotton India brand, on par with internationally recognized cotton brands such as Pima (USA) and Giza (Egypt). ICAR-CIRCOT has been empanelled as the designated laboratory for quality testing and conformity assessment of Kasturi Cotton. The Institute also plays a pivotal role in formulating and standardizing the quality parameters and testing protocols for the Kasturi Cotton India brand. Further strengthening its contribution to cotton quality assurance and commodity trading, ICAR-CIRCOT has been recognized as an Approved Assayer by the Multi Commodity Exchange Clearing Corporation Ltd. (MCXCCL) for the quality analysis of cotton bales traded in the commodity market.

Skill Development

The Institute has been conducting customized skill development programmes at both the national and international levels to strengthen the capacities of stakeholders across the cotton value chain. It also organizes training programmes for farmers on post-harvest cotton processing, value addition to cotton by-products, and village-level production and processing technologies aimed at enhancing farm income. The Institute also organises the skill development under the Scheduled Caste Sub-Plan to benefit the students, farmers in the community. The institute conducted **capacity-**

building (in-plant) training in its laboratories for students from agriculture, post-harvest technology, and allied disciplines, benefiting **students** from various academic institutions.

At the international level, ICAR-CIRCOT has actively contributed to capacity building in the cotton sector of African countries through the **Cotton Technical Assistance Programme (Cotton-TAP) for Africa**. The Institute has also supported the **United Nations Conference on Trade and Development (UNCTAD)** in implementing a **United Nations Development Account Project** aimed at promoting Cotton by-produce based developmental activity in Eastern and Southern Africa.

Incubation Services

The **Agri-Business Incubation (ABI) Centre** at the Institute is dedicated to nurturing and supporting startups and enterprises that develop innovative technologies for post-harvest cotton processing and value addition to cotton and its biomass, in line with the **Start-up India** initiative of the Government of India. The **CIRCOT also hosts RKVY-RAFTAAR Agri-Business Incubator (CIRCOT-R-ABI)** funded by **Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India**, for providing suitable platform for development of start-up ecosystem in agriculture and allied sector.

Commercial Testing and Evaluation Excellence

ICAR-CIRCOT is globally recognized as a premier laboratory for providing comprehensive commercial testing and evaluation services for cotton fibres, yarns, textiles, and cotton-blended fabrics. The Institute's laboratories has maintained **NABL**

accreditation in accordance with **ISO/IEC 17025** standards to ensure accurate, reliable test results. Reflecting its excellence in cotton fibre quality assessment, ICAR-CIRCOT's test accuracy was ranked **6th among 175 fibre testing laboratories in the CSITC Global Round trials organised by International Cotton Advisory Committee, Washington DC, USA.**

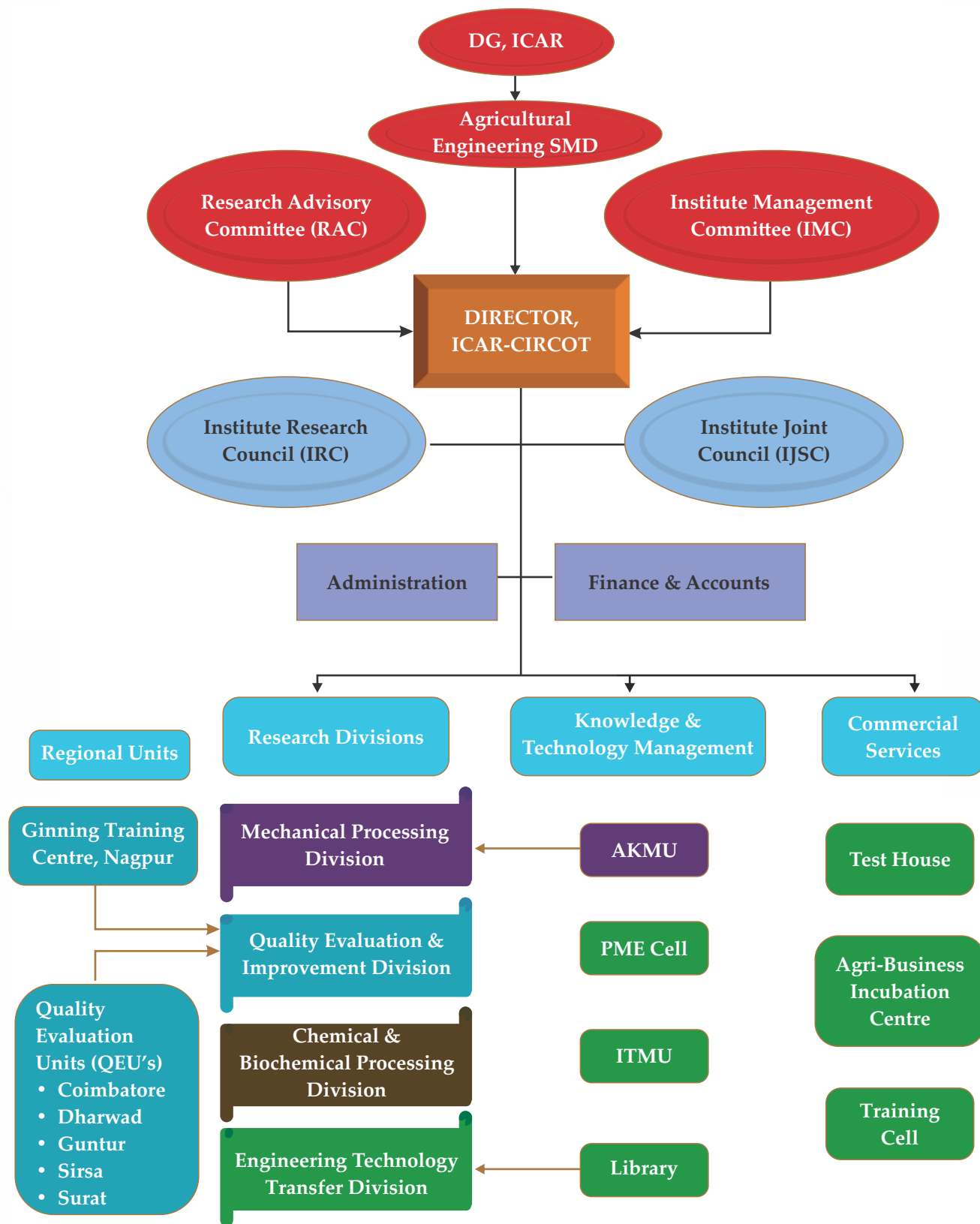
Research Management & Administration

The Institute is headed by the Director, who is supported by the Heads of the Divisions and the Administration and Finance & Accounts Sections in the overall management and functioning of the Institute. The **Research Advisory Committee (RAC)**, constituted by the

Council, provides strategic guidance in planning and reviewing the Institute's research programmes. The **Institute Management Committee (IMC)** assists the Director in matters related to the administration and overall management of the Institute. The progress of research programmes is periodically reviewed through the **Institute Research Council (IRC)**, under the chairmanship of the Director. The **Priority Setting, Monitoring and Evaluation (PME) Cell** supports the Director in monitoring and evaluating research progress, coordinating with the Council, and facilitating effective planning, reporting, and implementation of the Institute's research activities.

The staff position of the institute as on 31.12.2025 is given in Table 1.1

Category	Sanctioned posts	In position (as on date)
Director	1	1
Scientific	48	27
Technical	106	53
Administrative	35	16
Skilled Supporting Staff	36	15
Total	226	112



Organogram of ICAR-CIRCOT, Mumbai

Finance Management: ICAR CIRCOT has a total fund allocation of Rs. 3586.51 lakhs and the CRP on Natural Fibres has an allocation of 129.69 lakhs for the period 2025-26. The Institute has ensured 100% utilization of the budget allocation. The institute has also

received additional funding through the externally funded projects to supplement its financial resources. The overall revenue generation target for the institute for the year 2025-26 was Rs. 439 lakhs and the institute has generated Rs. 473.91 Lakhs during the period.

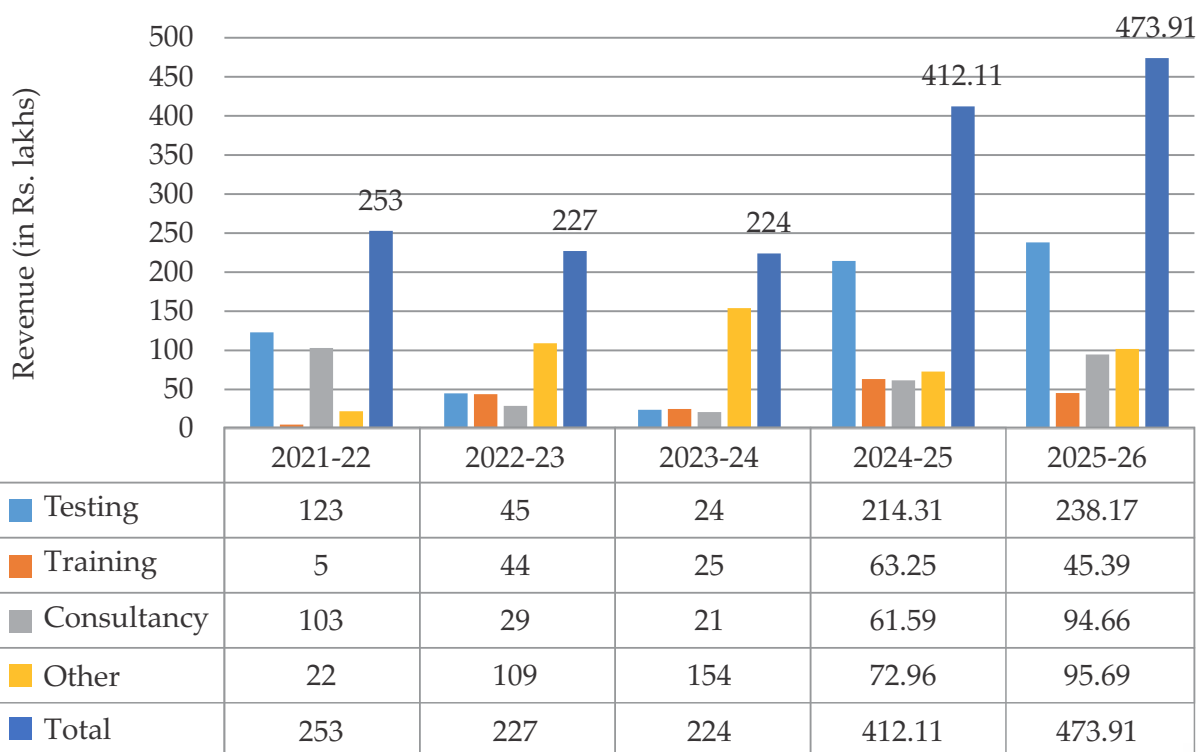
Fund Utilization of ICAR-CIRCOT (including SCSP, NEH) (Rs. in lakhs)

Head of Expenditure		FY 2025-26		
		Allocation	Expenditure	Utilization %
Grant-in-Aid-Capital		307.10	307.10	100%
Grant-in-Aid-Salaries		2023.55	2023.55	100%
Grant-in-Aid-General	Pension only	630.40	630.40	100%
	Other than Pension	625.46	625.46	100%
Total		3586.51	3586.51	100%

Fund Utilization under CRP on Natural Fibres (Rs. in lakhs)

Head of Expenditure	FY 2025-26		
	Allocation	Expenditure	Utilization %
Grant-in-Aid-Capital	37.71	37.71	100%
Grant-in-Aid-General (Other than Pension)	91.98	91.98	100%
Total	129.69	129.69	100%

Internal Revenue Generation



Chapter 2

2. Salient Research Achievements

2.1. Core Area I: Ginning and Pre-Ginning

2.1.1 Refinement in heating and cottonseed conveying system of cottonseed dryer

(MP 106 – PI: Dr. Varsha Satankar)

Cottonseed production is estimated at 11 million tonnes per annum, that serves as a valuable resource of edible oil and manufacturing protein-rich oil cakes used in animal feed. Cottonseed typically contains about 18% oil content and its recovery is largely dependent on the moisture content in the seeds. The amount of oil recovery and the quality of cakes are significantly impacted by the moisture content and 12% moisture content is considered ideal for expelling oil and producing quality cakes from cottonseeds.

During the early cotton season, the moisture content in cottonseeds typically ranges between 15% to 40%. To bring it down to the optimum level, ginners often rely on the traditional, time-consuming, and labour-intensive method of open sun drying. However, with the increasing unpredictability of weather due to climate change, consistently obtaining dry and sunny days during the ginning season has become a major challenge. This leads to the processing of high-moisture cottonseeds, resulting in reduced oil recovery and compromised cake quality. Additionally, storing wet cottonseeds further accelerates quality deterioration due to fungal growth and spoilage.

Cottonseed Dryer: A compact, energy-efficient continuous flow type cottonseed dryer based on the direct heating method (Fig. 2.1.1) was developed by ICAR-CIRCOT, in technical collaboration with M/s. Bajaj Steel Industries

Ltd., Nagpur. This innovative solution has been developed under a Public-Private Partnership (PPP) model, with the aim of enabling efficient online drying of cottonseeds directly within ginning units, thereby improving processing efficiency and product quality. The overall thermal efficiency of dryer is 66%. The system is suitable for handling throughputs of 5 TPH and 8 TPH, respectively. Reducing seed moisture to the optimal level leads to a 2% increase in oil recovery and a notable improvement in the protein content (2-3%) of the resulting oil cake, thereby enhancing the overall value of the by-products.

Key Features : It reduces the moisture level to optimum level from 30-40% to 10-12%. It improves the oil recovery by 2% & protein content by 2-3 %. Fuel efficient system, requires about 150 kg wood fuel/biomass briquette for drying of cottonseeds having 40% moisture content. The dryer utilizes a collapsible mild steel (MS) conveyor belt design, allowing each belt to function in both top and bottom positions, ensuring double-sided heating of cottonseed and achieving 10-stage drying using only 5 belts. New improved energy efficient heat exchanger design with finned ducts and tubes in heat exchanger enhancing heat transfer efficiency. Larger size combustion chamber to accommodate larger quantity of fuel briquettes.



Fig.2.1.1 Energy efficient continuous flow Cottonseed dryer (installed in the ginning factory)

2.1.2 Evaluation of effectiveness of air jet cleaner for trash control in ginning industry to qualify Kasturi cotton trash standards

(MP 108 – PI: Dr. V.G. Arude)

Air jet cleaning system for trash control:

Lint cleaning system with a capacity of one tonne of lint per hour was designed comprising two numbers of three-cylinder type lint cleaner, air jet lint cleaner, by-pass arrangement for cylinder type lint cleaner, pneumatic lint suction system comprising of suction fan, air separator, ducting and cyclone. The air jet cleaner system in accordance with existing layout of the ginning pilot plant was fabricated, erected and commissioned at GTC, Nagpur (Fig. 2.1.2).

The existing two numbers of three-cylinder spade type lint cleaners are installed as a part of lint cleaning system. Lint suction system from existing DR gin house to cylinder type lint cleaner has been modified and fabricated with GI ducting line of 20-gauge 15-inch and 17-inch diameter piper with suitable bends and diverters as per the design layout. The by-pass arrangement has been fabricated and installed over the second cylinder type lint cleaner to by-pass the air jet cleaner. Lint suction system to convey the lint from both the cylinder type lint cleaner and the air jet cleaner

to the existing air separator of bale press has been designed and fabricated. A diverter and by-pass arrangement to drop lint from bale press air separator to ground level was fabricated and installed for easy collection of lint after lint cleaning during experimental trials.

Centrifugal suction fan, with 30 HP four pole belt driven electric motor having a capacity to generate minimum air volume of 12500 cubic meter per hour at an air pressure of 350 mm water gauge, for effective conveying of lint through air jet lint cleaner to air separator has been mounted on the existing bale press. GI ducting line for lint conveying was fabricated out of 20-gauge sheet and of 17-inch and 21-inch diameter with a provision of suitable bends as per the layout.

Air Jet type lint cleaner is a flow through type of lint cleaner with a capacity to process lint equivalent to 10 bales (170 kg each) per hour and trash removal efficiency of 30-40%. Air Jet lint cleaner has inside length of 48-inch and overall length of 60-inch, width of 62-inch and

height of 45-inch. The outer body is made out of 10 mm thick MS plate. The vacuum of 2-2.5 inch of water is being maintained in the duct on the discharge side of the cleaner. Loose lint is being conveyed by air into the cleaner through a narrow trash ejection slot at an air velocity of 12000 feet per minute. Inlet duct carrying air and lint makes an abrupt change in direction. Adjustable knife assembly, adjustable sheet, pipe section and an adjustable mote opening (1 inch factory set) are provided. A lever mechanism is provided on the top of the cleaner to move the mote opening device. Trash chamber is provided below each type of lint cleaner for trash collection. Optimization of the air jet cleaner system will be carried out to assess its effectiveness for trash removal.



Fig 2.1.2: Air Jet Cleaning System installed at GTC Nagpur

2.1.3 Development and standardization of Contamination Measurement Techniques in Cotton

(MP 109 – PI: Dr. Shekh Mukhtar Mansuri)

Imaging system for contaminant measurement:

A controlled imaging chamber specifically suited for cotton sample analysis was developed (Fig. 2.1.3). The chamber was equipped with both UV and white light sources, which helped in observing different types of contaminants such as plastic, leaf particles, threads and other foreign materials.



Fig 2.1.3 Imaging setup integrated with UV light and white light illumination

An imaging system using a microcontroller and camera module was also set up, allowing real-time display of images on a monitor for easy observation and validation. In addition, custom image capture software was also developed to ensure that images are taken in a consistent and repeatable manner under controlled conditions.

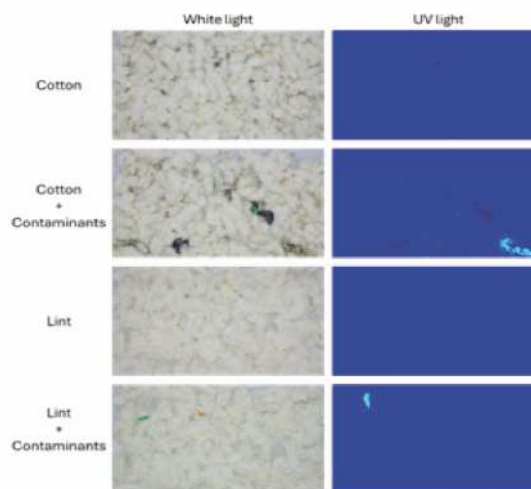


Fig 2.1.4 Cotton and lint imaging under different light condition

Initial experimental trials were carried out using cotton samples with different types of contaminants under various lighting conditions (Fig. 2.1.4). These trials helped in creating a preliminary dataset of contaminants images. Important parameters such as contaminant

area percentage, size and their distribution within the sample were identified for further study and standardization. Work on developing image processing algorithms and validating the results with manual grading is under progress.

2.1.4 Development and Evaluation of seed cotton storage bag with antimicrobial finish

(MP 110 – PI: Dr. Ashok Kumar Bharimalla)

The project aims to develop ergonomically designed cotton storage bags with antimicrobial finishing to improve hygiene, reduce contamination, and enhance storage efficiency during cotton handling and transportation.

Seed cotton storage bag with anti-microbial finish:

Greige cotton fabric of 250 GSM (900 m length and 1.36 m width) was sourced from the local market. The fabric was treated with Nano Zinc Oxide (Nano-ZnO) using an in-situ process (Fig. 2.1.5). The bag capacity, dimensions, shape, and tying mechanisms for ease of handling were arrived at based on the brainstorming session. Based on the study, a 50 kg capacity cylindrical-shaped bag was found

to be optimal, with approximate dimensions of 1.32 m × 0.65 m (Fig. 2.1.6).

A total of 150 bags of varying capacities were stitched. Seed cotton having 8% moisture (constant) and 12% moisture (enhanced) were stored at ICAR-CIRCOT Mumbai Headquarters and GTC Nagpur for quality evaluation. Storage studies were conducted using treated bags, untreated bags, and open storage conditions for comparative analysis. For micro-environmental monitoring, sensors for CO₂, relative humidity (RH), and temperature were installed. The data is being recorded and stored through cloud systems. Approximately 25 bags were distributed to farmers for field use and to get their feedback.



Fig 2.1.5 Antimicrobial finishing of the greige fabric in industry



Fig 2.1.6 Seed cotton storage bag

2.2. Core Area II: Mechanical Processing, Technical Textiles and Composites

2.2.1 Evaluation of electrospun nanofiber based multi - nutrient sachet for high-value crops

(MP 102 – PI: Dr. G.T.V. Prabu)

ICAR-CIRCOT has developed nanofibre production machines capable of producing high-surface-area electrospun nanofibre mats. These nanofibre mats can be used for agricultural applications as controlled-release substrate for supplying micronutrients to plants.

Bulk production of nanofibers: Bulk production of PVA multi-nutrient electrospun mats impregnated with three nutrients (zinc/iron/boron) in the proportions 6 mg/4 mg/4 mg, 12 mg/4 mg/4 mg, and 24 mg/8 mg/8 mg respectively (Fig 2.2.1) was done using multi-phase electrospinning apparatus. The optimized electrospinning parameters for producing uniform multi-nutrient-impregnated mats with consistent fibre formation and uniform fibre distribution are collector distance of 13–15 cm, a flow rate of 0.3–0.4 mL h⁻¹, a syringe pump traverse speed of 1 mm s⁻¹, and an applied voltage of 17–20 kV. The rotating drum collector was operated at 400 rpm. Approximately 250 sachets of each multi-nutrient combination were produced.



Fig 2.2.1 Multi-nutrient Sachet with different proportions of zinc, iron and boron

Green Cucumber Polyhouse trial: The polyhouse trial was conducted in a Completely Randomized Design (CRD) with five treatments (Table 2.2.1) and five replications using the commercial cucumber variety Emirstar RZ-F1. Plant growth parameters were recorded at regular intervals. The control treatment consisted of three nutrients applied in recommended doses in different combinations viz., zinc sulphate, iron sulphate, and boron. Ten days after planting, a nutrient sachet was placed in each plant, and drip irrigation was provided daily to maintain adequate soil moisture. Harvesting was performed more than four times during the crop cycle, which lasted 75 days. The study focused on plant growth response under electrospun nanofibre-based nutrient release, along with biomass yield and nutrient analysis.

Table 2.2.1: Treatments for CRD experiment trials

S.No	Treatments
1	Absolute control
2	RDN (Zinc 450 mg, Iron 360 mg, Boron 360 mg)
3	Zn 6 mg, Fe 4 mg, B 4 mg
4	Zn 12 mg, Fe 4 mg, B 4 mg
5	Zn 24 mg, Fe 8 mg, B 8 mg

Among the treatments, T5 (24 mg Zn, 8 mg Fe, and 8 mg B) exhibited superior performance at different stages (30, 45, and 60 days after planting). The maximum vine length recorded was 374.2 cm at 60 days, and the T5 dose was considered the optimum micronutrient level due to the consistent and controlled release of nutrients through the electrospun nanofibre mat, ensuring adequate availability. Biomass production under T5 was notably higher, with fresh biomass of 4.78 kg per plant and dry biomass of 0.29 kg per plant, significantly

surpassing other treatments. Root growth was also superior in T5, while T4 (12/4/4) recorded root and shoot length of 49.8 cm. In terms of yield, T5 produced a significantly higher yield of 3.25 kg per plant compared to the recommended dose of nutrients (RDN: 450 mg Zn, 360 mg Fe, and 360 mg B per plant), which yielded 1.95 kg per plant (Fig. 2.2.2). The nanofibre-based nutrient delivery system demonstrated a yield improvement of nearly 67% over RDN while using substantially lower nutrient quantities.



Fig2.2.2 Plant growth response as measured by Yield of cucumber under different treatments

2.2.2 Development of Quality Norms for Rotor spinning of indigenous cotton and its value addition

(MP 111 – PI: Dr. N. Shanmugam)

In India, particularly in the northern regions, cotton varieties tend to be short staple with high ginning out-turn and greater resistance to pest attacks. Currently, ring spinning technology with established standard norms for screening cotton varieties, is predominantly used for research. The rotor spinning units are mostly situated in the southern regions, where short-staple cotton is not widely grown and as a result, the rotor spinning industry relies on cotton initially meant for ring spinning leading

to potential quality concerns. As rotor spinning technology is well-suited for short-staple cotton, a comprehensive study was undertaken to develop quality norms for rotor spinning and exploring possible value addition.

Six cotton types viz., V 797, Giza 94, RCH 659, Fuma, DCH – 32, and Kasturi were selected for the study. All the six cottons were tested for its fibre properties (Table 2.2.2) at CIRCOT HVI laboratory using USTER High Volume Instrument.

Table 2.2.2 Fibre properties of the selected cotton cultivars

Sr. No.	Cotton	UHML	UI	MIC	TEN	ELG	Rd	(+b)	CG
1	V 797	22.8	79	5.5	23.1	4.8	72.6	9.9	32-2
2	GIZA 94	32.7	87	4.0	37.1	6.5	75.8	10.4	22-1
3	RCH 659	28.3	82	4.0	29.5	5.6	76.1	11.1	12-2
4	FUMA	36.0	88	4.6	36.0	6.5	78.1	8.6	31-1
5	DCH-32	34.3	86	3.5	33.4	6.3	71	11.5	33-1
6	KASTURI	30.3	83	4.4	34.1	5.2	80.3	9.5	31-3

UHML – Upper half mean length (mm), UI– Uniformity index, MIC– micronaire, Ten – Tenacity (g/tex), ELG – elongation (%), Rd – Reflectance, Rd – Yellowness, CG – colour grade

All the cottons were processed through the Trutzschler blow room as given here: Raw cotton lint → Three bladed blader → Axiflow cleaner → CVT-3 → Krischner Beater → Lap. The lap is then processed through conventional

card and given 2 passages LR/DO 2S draw frame. The final passage DF sliver hank was kept at 0.130. Each cotton was spun to 3 counts viz., 10s Ne, 20s Ne and 30s Ne, at rotor spinning with 2 twist multipliers (Table 2.2.3).

Table 2.2.3. Rotor Spinning Variables

Rotor speed	Rotor dia	Op. roll speed	Yarn count	T.M.	TPI
50,000 rpm	54 mm	8,000 rpm	10s Ne	4.5	14
				5.7	18
			20s Ne	4.5	20
				5.4	24
			30s Ne	4.5	25
				5.5	30

The yarn produced out of each experimental run was tested for yarn lea CSP and yarn count using standard test method IS: 1671 (reaffirmed 2018) – method for determination of yarn

strength parameters of yarns spun on cotton system. Thirty test specimens were used and average calculated for yarn CSP and yarn count (Fig. 2.2.3).

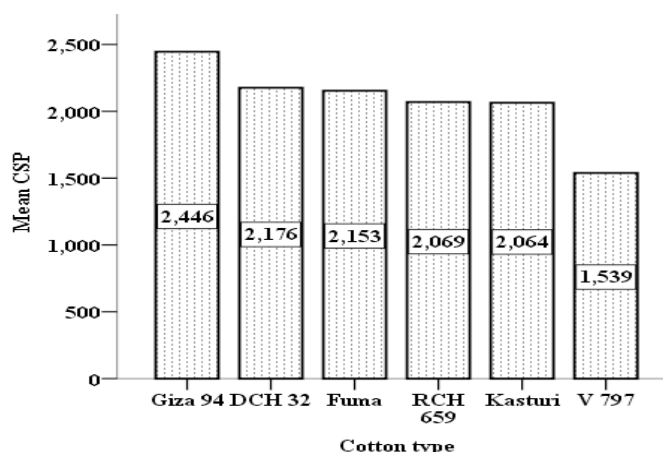


Fig. 1 Effect of cotton type on rotor yarn CSP

The influence of the cotton variety and its properties on the yarn CSP is shown in Fig. 1. It can be seen that the highest average CSP of 2446 was observed for Giza 94. Egyptian cotton Giza 94 is found to possess a cotton fibre bundle strength of 37.1 grams per tex and it translated into yarn strength. In terms of CSP, DCH 32 cotton is in the second position among the cotton studied. Even though its UHML is

higher than the Giza 94 by 1.6 mm, it did not contribute to the strength of yarn. In ring spinning, the UHML plays most important role in deciding the yarn strength, where as in rotor spinning, the strength is the most important parameter. Study on the effect of blending recycled and waste cotton in different proportions to virgin cotton is in progress.

2.3. Core Area III: Characterization of Cotton & Other Natural Fibres, Yarns and Textiles

2.3.1 All India Coordinated Research Project on Cotton (Quality Research)

(A 1 – PI: Dr. A.S.M. Raja)

ICAR-CIRCOT provides inputs related to quality parameters of cotton and its analysis for different programmes running under the AICRP on Cotton. A total of 5249 cotton samples were analyzed from ICAR-Bt trials, National trials and different Zonal Trials (North Zone, Central Zone and South Zone). The quality parameters of all cotton fibre samples were measured by using the High-Volume Instrument operated in the HVI Mode. The fibre quality data was analyzed and compiled as a Technology report and presented in the AICRP on Cotton group meeting. The Annual group meeting of AICRP on Cotton was held on 21-23 March, 2025 at ANGRAU, Guntur. The major recommendations during AGM are:

- Research efforts should be further enhanced to produce cotton that meets the quality standards stipulated by the Kasturi Cotton Bharat branding program of the Government of India.
- Greater emphasis should be placed on producing Extra Long Staple (ELS) cotton with fibre qualities comparable to imported ELS cotton.

- Research efforts should focus on developing cotton varieties with a high ginning percentage—targeting around 40%—to improve overall cotton productivity
- During the AGM, a proposal was made to include a benchmark value for the ginning percentage (GP) of cotton.

Variety Identified: The variety identification Committee meeting was held on June 19, 2025 in virtual mode under the chairmanship of DDG (Crop Science). Total 91 entries of Bt cotton and 3 Non Bt entries were screened for identification. Out of 91 entries of Bt cotton, 80 entries have been identified for release. In case of non-Bt entries, all the three proposals were considered by the committee for identification. These include one *G. arboreum* variety and two desi hybrids.

Benchmarking of Ginning Percentage and Quality Parameters in Cotton Breeding Programme : Ginning Percentage (GP) is one of the important economical parameters in cotton trade. Every 1% increase in GP will approximately increase the lint yield by 2-3%. Current status of GP of Indian cotton hybrid

released from AICRP on Cotton were assessed from the AICRP fibre quality data for the year 2020-24. An internal meeting with all PI's of AICRP on Cotton was arranged on September 09, 2025 and stakeholder meeting was organized by ICAR-CICR on December 29, 2025 for revisiting the bench mark values of cotton. Many stakeholders expressed concern

about the fibre quality issues in Indian cotton and recommended to include fibre quality parameters along with GP for benchmarking. The new bench mark values (Table 2.3.1) were proposed taking into consideration their recommendation and Kasturi Cotton Bharat specifications.

Table 2.3.1 Proposed Bench mark values for varietal release under AICRP on Cotton

S. No	Staple length category	UHML (mm) range	Min. Uniformity Index (%)	Micronaire range	Min.Strength to Length Ratio	Min. Bench mark GP
1	Extra Long	32.6 - 35	85	3.0-4.2	1.1	33
		35.1 & above	85	3.0-4.0	1.1	32
2	Long	27.5-29.0	83	3.7-4.7	1.05	36
		29.1-32.5	84	3.7-4.5	1.05	35
3	Medium Long	25.1-27.4	82	3.7-4.7	1.05	37
4	Medium	22.1-25.0	81	3.7-4.7	1.05	38
5.	Short	Below 22	80	3.7-5.5	1.0	39

2.3.2 Development of Process protocol for ICAR-CIRCOT calibration cotton for standard reference material certification

(QE 116 – PI: Dr. Kirti Jalgaonkar)

Storage of ICAR-CIRCOT Calibration Cotton: ICAR-CIRCOT calibration cotton samples (Long, Short, ELS-L) weighing 200g each were stored in two types of packaging materials—plastic containers and cardboard boxes—under two storage conditions: controlled condition (65% RH, 25±2°C) and ambient conditions. After fifteen months of storage period, the results demonstrated no significant differences in fibre quality parameters (Upper Half Mean Length (UHML, mm), Uniformity Index (UI, %), Tenacity (g/tex), and Micronaire value (µg/inch)) between control and ambient storage

conditions, or between plastic containers and cardboard packaging.

Certification: The Quality manual in accordance with IS/ISO/IEC 17043:2023, “Conformity Assessment – General requirement for competence of Proficiency Testing Providers” as well as Quality Manual in compliance with ISO 17034:2016, “General requirement for the Competence of Reference material producers” has been finalized. The scope for accreditation as per the IS/ISO/IEC 17043:2023 is presented below in Table 2.3.2

Table 2.3.2 Scope for Accreditation of ICAR-CIRCOT calibration cotton programme

S. No.	Discipline/Group	Materials Tested	Component, parameter or characteristic tested/ specific test performed/ Tests or type of testes performed	Test method specification against which testes are performed and / or the techniques /equipment used
1.	Mechanical-Textile Materials	Fibres	Length of Cotton Fibres (Upper Half Mean Length - UHML)	ASTM D5867
2.	Mechanical-Textile Materials	Fibres	Length of Cotton Fibres (Upper Half Mean Length - UHML)	IS 233 (Part 4)
3.	Mechanical-Textile Materials	Fibres	Uniformity Index (UI)	ASTM D5867
4.	Mechanical-Textile Materials	Fibres	Uniformity Index (UI)	IS 233 (Part 4)
5.	Mechanical-Textile Materials	Fibres	Micronaire	ASTM D5867
6.	Mechanical-Textile Materials	Fibres	Micronaire	IS3674
7.	Mechanical-Textile Materials	Fibres	Tenacity of Cotton Fibres	ASTM D5867
8.	Mechanical-Textile Materials	Fibres	Tenacity of Cotton Fibres	IS 3675
9.	Mechanical-Textile Materials	Fibres	Colour of Cotton: Rd & +b value	ASTM D 5867
10.	Mechanical-Textile Materials	Fibres	Trash Content of Cotton (Gravimetric Trash Analysis)	IS 4871

2.3.3 Development of image-based trash measuring device using artificial intelligence

(QE 117 – PI: Dr. Himanshusekhar Chaurasia)

Accurate measurement of trash content in cotton is important for improving fibre quality and ensuring better performance during spinning. A fast and reliable method can help reduce losses and support better decision-making in processing units. Under this project, 290 cotton samples were collected and images were captured from both the top and bottom surfaces using Czur document scanner. All images were carefully pre-processed before analysis. The work was carried out in three parts: extracting features using image analysis

methods, extracting features using deep learning models, and combining both features to improve prediction accuracy.

Image processing: Using image analysis methods alone, strong results were obtained. Among the different prediction models tested, XGBoost performed the best with a test R^2 of 0.895. Deep learning-based features also gave comparable performance. DenseNet201 features combined with XGBoost achieved a test R^2 of 0.892. When both classical image

features and deep learning features were combined, the performance improved further. The best overall result was obtained using DenseNet201 features along with image analysis features trained using XGBoost, achieving a test R^2 of 0.903. This confirms that combining both approaches provides more reliable prediction of trash percentage.

Hardware development: The first prototype of the device was developed using 3D printing (Fig 2.3.1). The system uses a Raspberry Pi with a touch display and camera module for image capture. A user-friendly interface was created in Python 3.11.9, allowing users to capture images from both sides of the sample and obtain the predicted trash percentage directly on the screen.

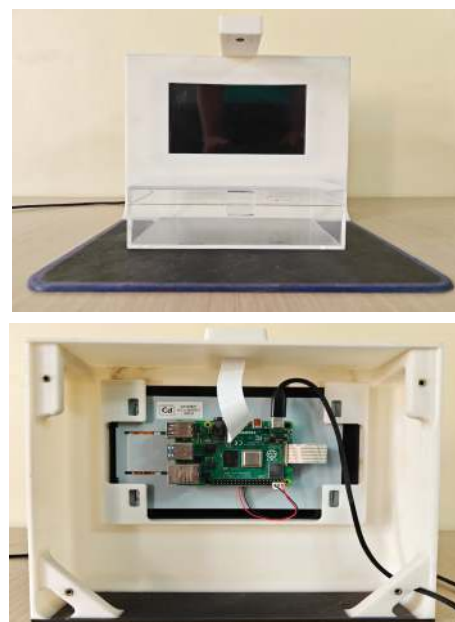


Fig 2.3.1 Prototype of the developed trash detection system

2.3.4 Development of AI based portable device for non-destructive measurement of ginning percentage (GP)

(QE 118 – PI: Dr. Sharmila Patil)

The Ginning Percentage (GP) of seed cotton is a key determinant of lint yield and directly influences the economic value of cotton. The existing method of GP measurement using portable laboratory gins requires physical ginning and separate weighing of lint and seed, making the process time-consuming and labour-intensive. The aim of this project is to develop a portable device based on image processing and artificial intelligence for non-destructive, accurate, and real-time measurement of GP.

Image Acquisition Mechanism for Seed Cotton Imaging: The first prototype of the imaging setup was designed to obtain high-quality images of seed cotton samples. The setup comprised a white LED light source and a camera arranged within an enclosed compartment (Fig. 2.3.2). A glass plate was provided in the image acquisition area. Seed

cotton samples were spread uniformly in a single layer on the glass plate. The white LED light illuminated and penetrated the samples to facilitate image capture. The compartment was configured to maintain uniform thickness and stable positioning of the samples during imaging. This design enabled reliable, consistent, and high-quality image acquisition.



Fig. 2.3.2: Image acquisition setup

Computer Vision-Based Algorithm for Seed Counting in Cotton Sample: The output image obtained from the imaging set up shows pixels with dark intensity indicating the presence of seed, and pixels with relatively bright intensity indicating the presence of lint. The seed counting algorithm was developed using image processing techniques to accurately distinguish seeds from lint in seed cotton samples. Initially, global thresholding approach was applied to convert the image into a binary format by using a suitable threshold value. However, due to overlapping intensity ranges between seeds and lint, this method was found to be less effective and resulted in loss or merging of seed

regions. To clearly distinguish the background from the seed portion, contrast of the image was enhanced using Contrast Limited Adaptive Histogram Equalization (CLAHE) technique. This significantly enhanced local contrast and provided better separation between seeds and lint (Fig 2.3.3). After the enhancement, a threshold was applied on the processed image to convert it into a binary image where white pixels indicate seeds and black pixels indicate lint portion. A contour-finding algorithm was applied to the threshold binary image to detect the number of connected regions, which directly indicates the number of seeds in the given image.

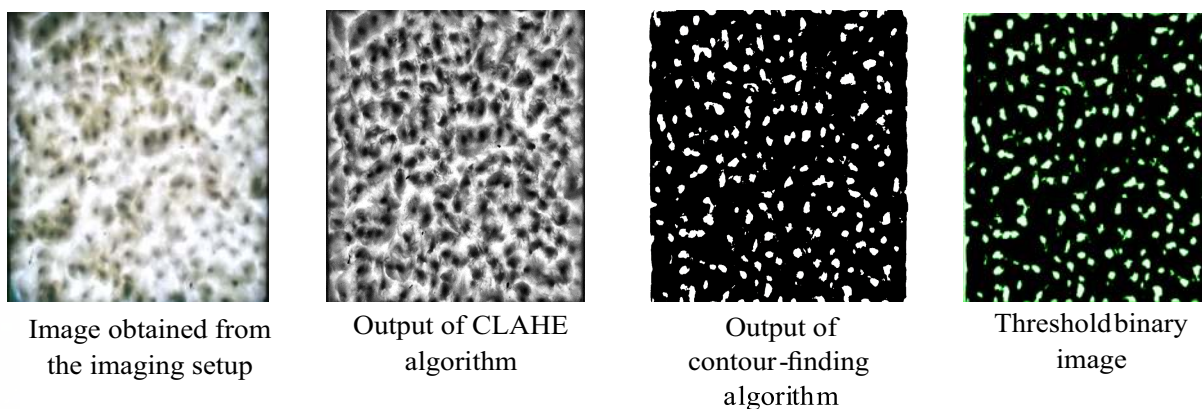


Fig. 2.3.3: Image processing using computer vision-based algorithm

2.4. Core Area IV: Chemical and Biochemical Processing and Biomass & By-product Utilization

2.4.1 Effects of process parameters on cottonseed oil extraction.

(CH 104 – PI: Dr. Jyoti Dhakane Lad)

ICAR-CIRCOT has developed optimized cottonseed processing protocol to enhance oil recovery in industrial expeller units. Trials conducted in commercial oil mills in Maharashtra, Haryana and Punjab revealed that maintaining cottonseed moisture at around 8–10% and operating a 9-bolt screw expeller at lower speeds (about 15-16 rpm) significantly improves oil yield. These conditions also help

maintain low free fatty acid (FFA) levels in crude oil, thereby reducing chemical requirement and losses during subsequent oil refining. In contrast, high moisture (>14%) or higher screw speeds (>17 rpm), in both 9-bolt and 12-bolt expeller led to significant reduction in oil recovery and increased FFA levels. Importantly, the protein content in the residual cottonseed cake—a valuable feed

component—ranged from about 20.6% to 25.1% (dry basis), with highest values observed at moderate seed moisture and screw speed conditions. The study recommends conditioning of cottonseed to moderate moisture content and operating the expeller at

the lower end of its permissible screw-speed range so that processors can obtain higher oil recovery, and high-quality protein in the cake, thereby benefiting both the edible oil and animal feed industries.

2.4.2 Evaluation of cottonseed Hull for production of furfural.

(CH 105 – PI: Dr. Manoj Kumar)

Production of furfural from cottonseed hulls: A technology has been developed for the efficient production and analytical quantification of furfural from cottonseed hull biomass. The process involves size reduction of cottonseed hulls followed by optimized hydrothermal pretreatment in a high-pressure and high-temperature reactor to enhance pentose sugar release and promote furfural formation. Process parameters were systematically optimized using Response Surface Methodology (RSM) to maximize conversion efficiency and product recovery. Subsequent distillation of the pentose-rich hydrolysate enabled effective recovery of furfural with high purity (Fig. 2.4.1).

Spectrophotometric and HPLC-based methods were developed and validated for the rapid, accurate, and reliable detection and quantification of furfural. The optimized process achieved 99% furfural purity (HPLC-validated) with an overall yield of 23.72% from hemicellulose present in cottonseed hulls, whereas the conventional method resulted in a yield of 14.5%. This technology offers value-added solution for the sustainable utilization of cotton processing by-products, thereby supporting circular bioeconomy initiatives for green chemical production.



Fig. 2.4.1: Production of furfural from cottonseed hulls using high pressure – high temperature reactor

2.4.3 Development of microbial enzyme-mediated delinting process from cottonseeds.

(CH 106 – PI: Dr. K. Pandiyan)

The existing methods for delinting of cottonseeds are environmentally harmful (Acid delinting) or more energy intensive (mechanical). The waste water released during acid delinting process contaminates the productive soil and also causes ground water pollution. The attempts toward development of greener method for delinting of cotton seeds were very limited. A delinting process using commercially available microbial cellulase enzyme was conceptualized, experimented with cotton seeds, and optimized the process conditions and parameters for removal of cotton linters in cotton seed.

Enzymatic delinting process: The fuzzy cotton seeds were added with commercial cellulase (FPU) (prepared in sodium citrate buffer, pH 4.8) in the ratio of 1:10 and incubated at 50 °C in shaking water bath at 120 rpm at different time intervals from 1 h to 6 h (Fig. 2.4.2). The enzyme concentration in the mixture was varied from 10% v/v to 50% v/v. After incubation, the seeds were washed with tap water in order to remove the residual buffer and dried at room temperature (Fig. 2.4.3). The findings revealed that more than 90% of delinting of cotton seeds was achieved with 10% enzyme concentration in 3 h.

Enzymatic Delinting & Seed germination: The germination assay of delinted seeds (0.5–6 h at 50 °C) revealed that cottonseeds treated with crude cellulase enzyme (10%–50%) were found to lose their viability (20%–100%) when the enzyme concentrations were increased from 10% to 50%. The viability of cottonseeds in the control (no enzyme) remained unaffected (100% germination) for up to 5 h of incubation at 50 °C; however, it declined to 80% after 6 h.

Conversely, the viability of enzyme-delinted cottonseeds started to decline at the 4-h incubation period from 80 ± 10.0 % (10% v/v enzyme) to 20 ± 0.0 % (40% and 50% v/v enzyme). Complete viability (100%) was lost in delinted seeds at enzyme concentrations of 30%, 40%, and 50% for >4 h (Fig. 2.4.4).

During the initial study at 50 °C for 6 h incubation, the failure of viability in enzyme-mediated delinted seeds may be attributed to the temperature (50 °C) and incubation period (6 h) as the higher temperature and longer incubation period might have damaged the seed coat, which led to the disruption or denaturation of proteins and other vital components of seeds responsible for viability and germination of seeds. Further experiments performed with parameters, enzyme concentration, and incubation period demonstrated that cottonseeds with defined enzyme concentrations incubated for a longer period resulted in declining viability. This may be because the seed coat may be damaged when the cellulase enzyme interacts with seeds for a prolonged duration, resulting in loss of viability.

Similarly, cottonseeds treated with crude cellulase enzyme (10%–50%) were found to lose their viability proportionally (20%–100%) when the enzyme concentrations were increased from 10% to 50%, irrespective of incubation time (Fig. 2.4.4). This could be attributed to the cellulase enzyme mixture that might have damaged the lignocellulosic components, especially cellulose and hemicellulose in cottonseeds when present at higher concentrations, which could lead to loss of viability.

Enzymatic Delinting & Oil content: The oil content in raw cottonseeds was 17.05 ± 0.29 %, in the control, where no enzyme was added. At 10% v/v of enzyme it showed a decline to 16.99 ± 2.51 % oil content at 0.5 h at 50 °C, further reducing to 16.48 ± 1.71 % at 6 h incubation. The lowest oil content (13.10 ± 1.66 %) was observed in cottonseeds treated with 50% v/v enzyme and incubated for 6 h



Fig. 2.4.2 Enzyme-mediated delinting process for cotton seeds and incubated at 50 °C in shaking water bath

(Fig. 2.4.5). Like the germination assay, the oil content in enzyme-delinted cottonseeds started declining proportionally when the enzyme concentrations were gradually increased. The reduction in oil content in enzyme-mediated cottonseeds may be attributed to the damage of seed coat by increased enzyme concentrations and prolonged incubation conditions, which might have negatively affected the oil content.



Fig. 2.4.3 Cotton seeds before and after delinting treatment with microbial cellulase enzyme

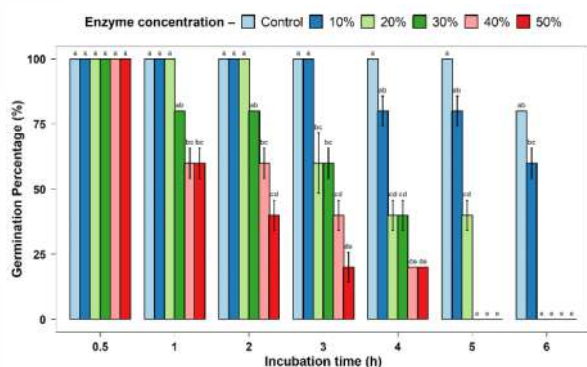


Fig. 2.4.4 Germination % of cottonseeds at varying cellulase concentrations (10-50% v/v) and evaluated across different incubation periods (0.5-6 h).

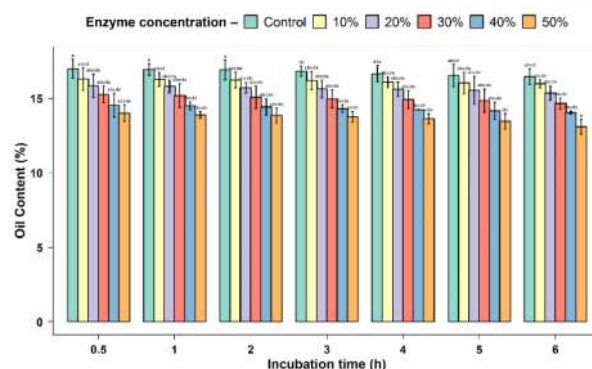


Fig. 2.4.5 Percentage of oil content in enzyme-delinted cottonseeds. (variety Suraj – Non Bt)

2.4.4 Microbial electrolysis cell (MEC) for efficient production of hydrogen gas from cotton biomass

(II 10 – PI: Dr. N. Vigneshwaran)

The transition toward sustainable energy highlights the importance of utilizing lignocellulosic biomass, such as cotton stalk and willow dust, as viable substrates for

hydrogen production via Microbial Electrolysis Cells (MECs). This study investigates the systematic optimization of hydrogen yields by evaluating various pretreatment methods,

inoculum ratios, and electrode materials. Initial assessments of substrate pretreatment revealed that while acid treatment provided moderate sugar release, enzymatic hydrolysis was the most superior method, yielding significantly higher reducing sugars at 22.15 mg/mL for cotton stalk and 20.71 mg/mL for willow dust. The efficiency of the MEC set up (Fig. 2.4.6) was further refined through optimization of the substrate-to-inoculum ratio. Trials indicated that a ratio of 5 g substrate to 10 g inoculum per litre was ideal, producing a gas volume of 35 mL within 24 hours, outperforming both higher and lower concentrations. To ensure the dominance of hydrogen-producing microorganisms, heat pretreatment of the inoculum at 100°C for 30 minutes was employed. Using these optimized parameters, cow dung cake inoculum performed better,

generating 116 mL of hydrogen in 48 hours, using 5 grams of substrate.

Material selection for the electrodes played a critical role in system performance, with graphite electrodes (33 S/m) yielding the highest output of 116 mL, surpassing steel and conductive PLA, while copper proved entirely ineffective. The cumulative impact of these optimizations was most evident in the long-term system performance; the electrode-assisted MEC generated a substantial 2000 mL of gas over 168 hours, whereas systems without electrodes generated only 370 mL. These findings conclude that the integration of enzymatic pretreatment, optimized substrate-inoculum ratios, and high-conductivity graphite electrodes significantly enhances the feasibility of MECs for efficient hydrogen recovery from agricultural waste.



Fig 2.4.6. Microbial Electrolysis Cell (MEC) setup featuring amber reactors with graphite electrodes (powered by a DC supply) and aspirator bottles for volumetric gas collection via water displacement.

2.4.5 Development of antimicrobial cotton textile for post-harvest packaging and handling of flowers

(II 11 – PI: Dr. Ajinath Dukare)

Characterization and microbiocidal evaluation of in situ AgNPs-functionalized cellulosic textile for active flower packaging: The research work primarily focused on the development, characterization and microbiocidal evaluation of in situ AgNPs-functionalized cellulosic textile intended for active flower packaging. The nano finishing process of cotton fabric was optimised with an aim to modify cotton textile having superior water and air barrier properties, surface morphology and broad-spectrum antimicrobial activity for enhancing storability of flowers. The systematic optimization of processing parameters established that 113 GSM cotton fabric, pretreated with 0.3% Sodium Lauryl Sulphate (30 min), followed by treatment with 0.5 mM AgNO₃ and incorporation of 1%

acrylic binder, yielded the most effective and reproducible antimicrobial performance.

The developed antimicrobial textile completely inhibited the growth of *Klebsiella pneumoniae*, *Aspergillus niger* and *Fusarium oxysporum* (Fig. 2.4.7). Light microscopy and hemocytometry analysis revealed inhibition of fungal spore germination and morphological distortion of microbial structures upon contact with the nano-finished fabric, establishing the dual antibacterial–antifungal potential of the fabric material. The SEM analysis confirmed uniform nanosilver distribution on the cotton fabric (Fig.2.4.8), while silver content and colorimetric analysis verified effective silver loading into the cellulosic matrix of fabric.

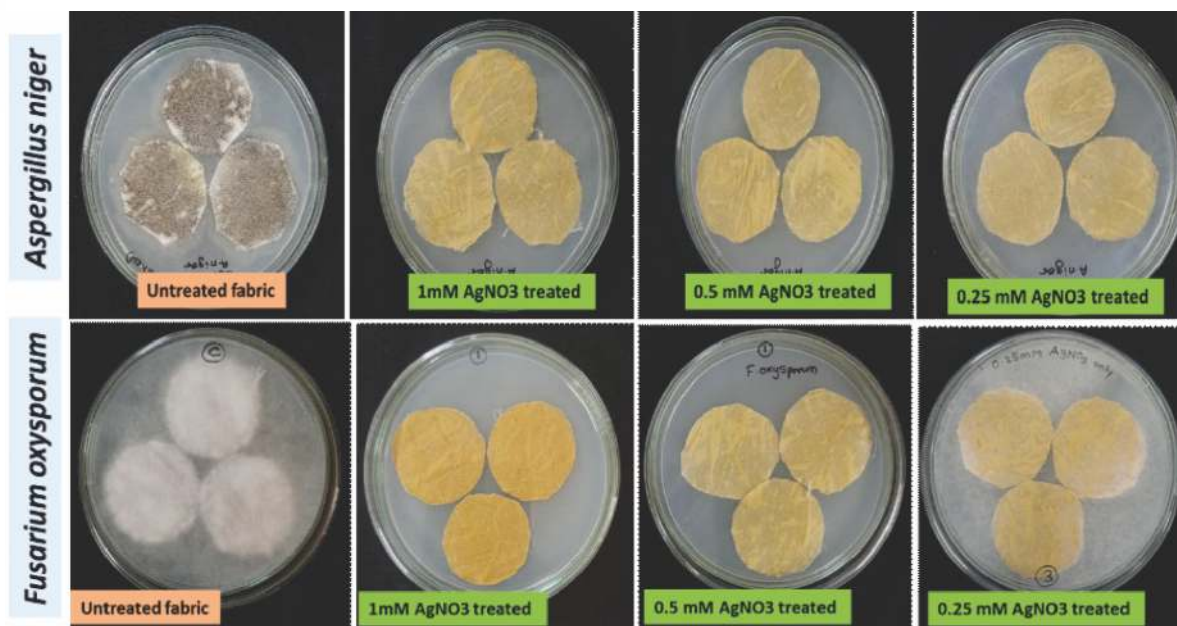


Fig.2.4.7 The antifungal activity of in situ nano silver functionalized cotton textile

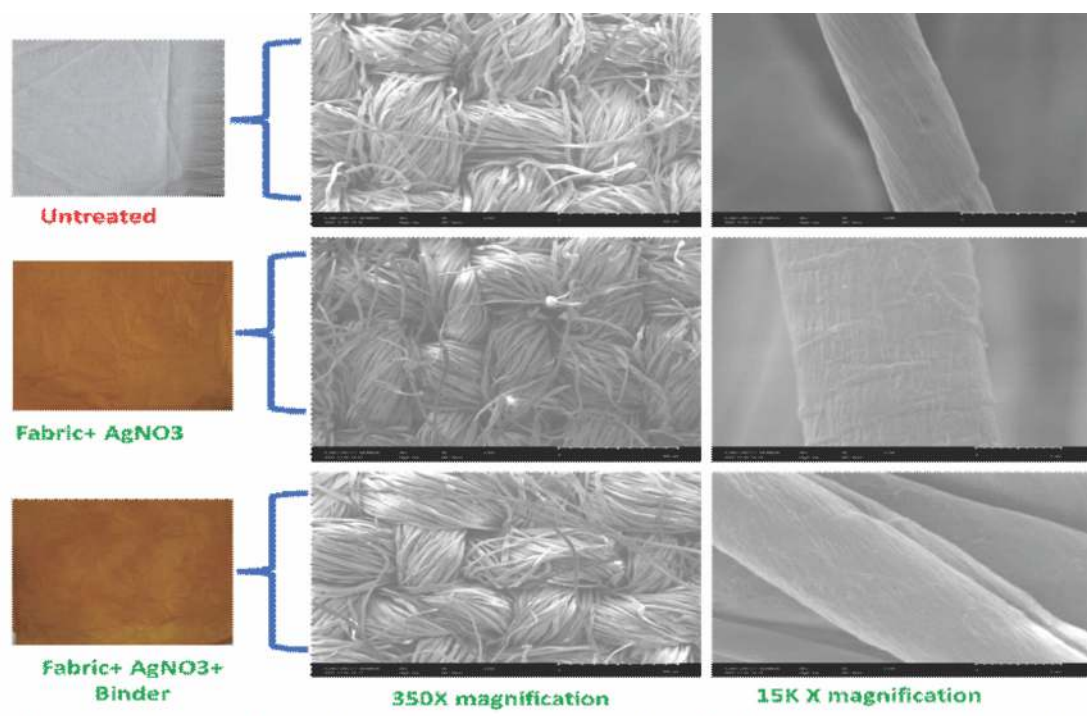


Fig. 2.4.8 SEM analysis of topographical features of nano finished cotton fabric exhibiting uniform loading of AgNPs particles onto cellulosic surface

The developed nanosilver finishing technology, imparts antimicrobial properties to cotton fabrics. When applied to packaging materials, this innovation helps minimize microbial growth on packed items such as flowers, which is validated in collaboration with ICAR - Directorate of Floricultural Research (DFR), Pune. Its utilization is expected to reduce post-harvest losses and extend the shelf life of flowers.

Licensing of the Technology: ICAR-CIRCOT, Mumbai has signed a Memorandum of Understanding (MoU) with M/s Mega Bags, Pune for the licensing of its technology for producing nanosilver-finished antimicrobial cotton textiles for the packaging of flowers during storage and transport.

2.4.6 Engineering microbial factories for enhanced xylitol production from cotton lignocellulosic biomass using CRISPR/Cas9 technology

(ICAR Genomic Research – PI: Dr. Manoj Kumar)

Selection of plasmid for CRISPR-Cas9 genome editing: After designing guideRNA (2024-25), the plasmid pML104 [Fig. 2.4.9 (A)] was selected for CRISPR/Cas9 genome editing due to its compatibility with *S. cerevisiae*, enabling efficient

expression of Cas9 and gRNA for targeted gene modification. The pML104 plasmid carries a URA3 selection marker, allowing efficient selection of transformed *S. cerevisiae* cells on uracil-deficient media.

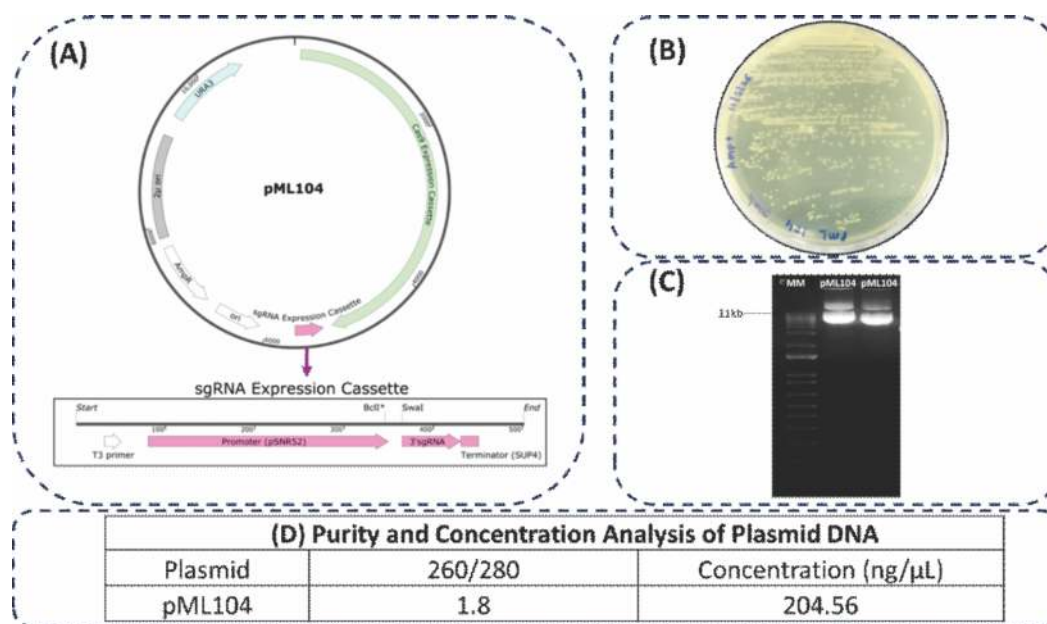


Fig. 2.4.9: (A) Plasmid pML104; (B) Growth of *E. coli* DH5 alpha containing pML104 plasmid; (C) Agarose gel electrophoresis of pML104 plasmid; (D) Purity and Concentration Analysis of Plasmid DNA.

Isolation and purification of plasmids from bacterial stab: The bacterial strain containing the pML104 plasmid (Addgene plasmid #67638), originally obtained as a gift from Axel Brunger via Addgene, was first cultured on a Luria-Bertani (LB) agar plate and incubated at 37 °C for 24 hours [Fig. 2.4.9 (B)]. A well-isolated single colony was then selected and inoculated into LB broth supplemented with ampicillin (100 μg/mL). The culture was incubated at 37 °C with shaking at 120 rpm. Plasmid extraction was performed using the High Pure Plasmid Isolation Kit (Cat. No. 11 754 777 001, Roche) following the manufacturer's protocol. The

concentration and purity of plasmid was checked on nanodrop and agarose gel [Fig. 2.4.9 (C) and Fig. 2.4.9 (D)].

Development of CRISPR/Cas9 Construct: Both the restriction-digested plasmid and the hybridized gRNA were used for the generation of the CRISPR/Cas9 construct. In this step, target-specific gRNA oligonucleotides targeting the XYL2 gene were ligated into the *SwaI*-*BclI*-digested pML104 vector using T4 DNA ligase. The ligation reaction was performed using the components and conditions described in Table 2.4.1.

Table 2.4.1. Ligation reaction setup for insertion of XYL2-specific gRNA into pML104

Ingredient	Volume (μL)
gRNA (hybridized)	1
Digested plasmid	10ng/μL
T4 Ligase buffer	0.9
T4 DNA ligase	1
Water	Up to 10μL
Temperature: 16°C, overnight	

Transformation of CRISPR/Cas9 construct in *E. coli* strain (DH5 α): Transformation of the ligated CRISPR/Cas9 construct into a suitable cloning host is essential for plasmid amplification and validation. *E. coli* DH5 α was selected due to its high transformation efficiency and recombination-deficient background, making it ideal for stable maintenance of recombinant plasmids. Chemically competent *E. coli* DH5 α cells were transformed with the ligation mixture containing the CRISPR/Cas9 construct using the CaCl₂-mediated heat-shock method as described previously. Transformed cells were plated on LB agar containing ampicillin and incubated overnight at 37 °C. Appearance of well isolated colonies on LB-ampicillin plates indicates effective uptake of the recombinant CRISPR/Cas9 plasmid [Fig. 2.4.10 (A)]. The presence of multiple well-isolated colonies suggested efficient ligation and transformation. Selected colonies were used for further screening to confirm correct insertion of the XYL2-specific gRNA into the pML104 vector.

Confirmation of CRISPR/Cas9 construct using colony PCR: Colony PCR was employed to

confirm the successful insertion of the XYL2-specific gRNA into the pML104-based CRISPR/Cas9 construct. Individual ampicillin-resistant *E. coli* DH5 α colonies were picked and briefly resuspended in sterile nuclease-free water. A small aliquot of this suspension was used as the template for PCR using gRNA-specific and/or vector-flanking primers. PCR amplification was performed under standard cycling conditions. The amplified products were resolved on agarose gel electrophoresis and visualized under UV illumination. Colony PCR analysis of *E. coli* DH5 α transformants showed clear amplification of the expected-size fragment in multiple colonies (lanes 1–4 and 7–10), confirming the presence of the gRNA insert in the pML104 CRISPR/Cas9 construct [Fig. 2.4.10 (B)]. The molecular marker (MM) was used to verify the amplicon size. Colonies displaying the correct amplification pattern were considered positive recombinants and were selected for plasmid isolation and further validation using sanger sequencing.

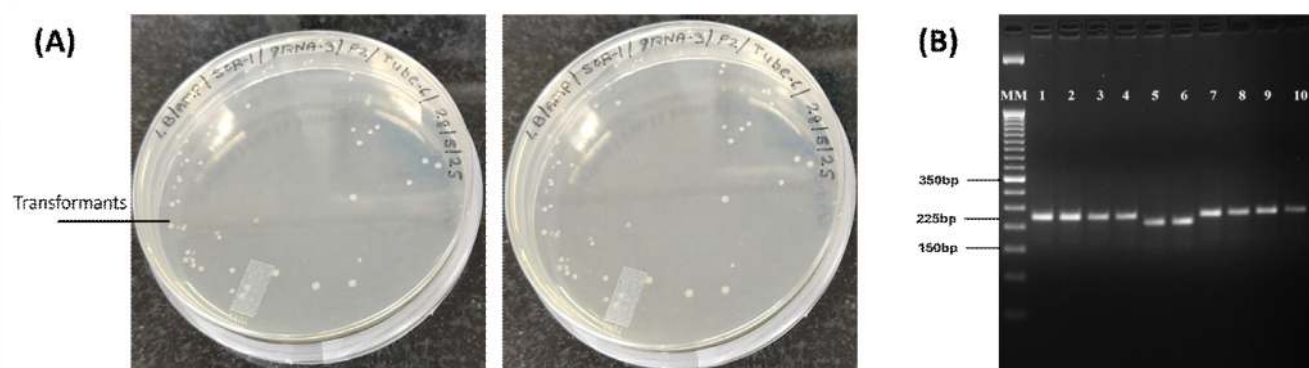


Fig. 2.4.10: (A) Transformant colonies of *E. coli* DH5 α on LB-ampicillin plate; (B) Agarose gel electrophoresis of colony PCR confirming gRNA insertion into pML104. Where, MM: Molecular weight marker (50bp).

Lanes 1–4 and 7–10: positive transformants with gRNA insertion.

Lanes 5 and 6 indicate transformants lacking gRNA insertion.

2.5. Core Area IV: Entrepreneurship and Human Resource Development

2.5.1 Impact Assessment of CIRCOT technologies.

(TT 12 – PI: Dr. Sundaramoorthy C)

The project aims to develop suitable framework for assessing the impact of the technologies developed by the institute and ascertain the economic impact of the technologies in the cotton sector.

CIRCOT Bajaj Cotton Pre Cleaner: The CIRCOT-Bajaj cotton pre-cleaner 's adoption in the ginning industry has grown from 12% in 2009 to around 32% in 2024. The overall economic benefit in terms of bale value improvement is estimated at Rs. 438 crores per annum.

ICAR-CIRCOT Calibration Cotton: The CIRCOT Calibration Cotton is an in-house technology and import substitute for the USDA calibration cotton. The institute has sold around 12877 boxes (200g each) since inception at an average of 515 boxes per annum. The economic impact by means of saving of precious foreign exchange is Rs. 58 lakhs per annum.

Value Addition to Cotton Biomass: The case study of the Briquetting plant (20 TPD capacity) to assess the value addition to cotton stalks has shown that farmers received Rs.1000 per acre

for the cotton stalks and the activity resulted in creation of seasonal employment for 3 months in rural area. The overall economic benefit by means of value addition to 1% of cotton stalks was estimated Rs 84 crores per annum. In last season, 6800 tonnes of biomass chipped through the Custom Hiring Centre established in GTC.

Portable Ginning Machine: The Portable Ginning Machine technology accounts for about 3% of the total production capacity of Licensee with a turnover of about Rs. 52 lakhs in the last ten years. On an average, the annual sales of the machine are around 22 machines.

Cottonseed Dryer: The seed cotton dryer technology commercialized to 5 industries with production capacity of 5-8 TPH. The economic benefit through improved oil recovery of 2% with better quality cake fetching price premium of 2-3% is estimated at Rs.6.5 crore per annum if operated under full capacity.

2.5.2 Development of project profile, Data bank and entrepreneurship in cotton processing

(TT 14 – PI: Dr. D.M. Kadam)

During the reporting period, Detailed Project Report (DPR) has been developed for the establishment of the 25,000-spindle spinning mill and Absorbent cotton production plant having a capacity of 2 TPD. The DPR for establishment of Protein Extraction Plant and Oil extraction plant is underway. The data bank on

the Cotton processing industries and related Plant and machinery suppliers has been prepared.

2.6. Externally Funded Projects

2.6.1 Development of High Production Double Roller Gin for Enhancing Viability of Cotton Ginning Industry

(CRG/2023/003974 [DST-ANRF-SERB]– PI: Dr. V.G. Arude)

Prototype of HPDR gin: The research prototype of High Production Double Roller (HPDR) gin was designed and fabricated with an aim to enhance ginning capacity of double roller (DR) gin by two folds to that of conventional DR gin. Design considerations comprise of increasing roller diameter, increasing cottonseed metering area of seed grid, increasing beater width and angle of beater arm, pneumatic type pressure mechanism between fixed knife and roller, independent drive for beater through VFD, independent drives for each roller through VFDs and gear box comprising of eccentric shaft, connecting rod, head pin and beater head. The developed prototype of high production double roller gin was tested for its functionality of ginning of cotton. The prototype could do the intended function of ginning however effective ginning could not be achieved. It was probably due to some problems related to machine design and some issues related to machine fabrication.

Modified Prototype HPDR: To overcome the problems encountered during functional testing following modifications were carried out in research prototype for ensuring effective ginning of cotton. Roller assembly was reworked by replacing damaged and bend leather washers, repressing at optimum pressure to get the desired hardness, fixing large sized end plates, finishing and grooving. The Pneumatic pressure mechanism assembly was redesigned and fabricated with a provision of independent pressure regulators at each end

of the roller so as to adjust the pressure suitably as per requirement at each end and ensure even pressure and optimum ginning.

The Knife rail assembly was redesigned and fabricated to reduce its width and increase the length to ensure free and continuous lint flow after ginning. The Beater assembly was modified to bring the tip of moving knives near to the ginning point while in running condition by changing the inclination angle of beater arm on either side of the beater shaft. This modification is also made with an aim to allow increased metering of cottonseed through seed grid after ginning. In the Gear box assembly, the eccentric shaft, connecting rod, head pin and beater head were redesigned to ensure proper force transfer and alignment and to reduce the machine vibrations. The outer cover of the gear box was redesigned to ensure enough space for free movement of the head pin while setting overlap.

Machine foundation was reworked by fitting each side frame of the machine with additional bolts at each end. Altogether machine was fitted with additional four foundation bolts making it eight in total. Power drive mechanism and control panel was replaced with electric motors of 5 HP with 10 HP to drive the ginning roller and beater. The controls panel with matching VFDs for each motor were also redesigned and fabricated. The modified HPDR gin (Fig. 2.6.1) is being evaluated for its functionality and will be optimized to enhance ginning efficiency.



Fig. 2.6.1 Prototype High Productive DR Gin

2.6.2 Design and Development of Seed Cotton Baling Machine for Effective Handling and Storage

(RGSTC 2025/294 – PI: Dr. Manoj Kumar Mahawar)

Fabrication of Prototype Baling Machine: The machine components and their working principles were identified. The design concept was translated into a 3D model (Fig 2.6.2), and efforts were initiated toward prototype development. To validate the proof of concept, a commercially available baler was procured, and trials were conducted for the baling of seed cotton. The machine operated with a conveyor system for feeding into a compression chamber equipped with grooved aluminium rollers operating at 600 rpm and powered by a 7.5 HP three-phase electric motor. The machine was evaluated using seed cotton and it could prepare bales weighing 35-40 kg. Random fibre samples were withdrawn from the bales and compared for fibre testing with loose cotton. The results revealed the fibre damage due to the direct contact of fibres with the rough surface of the rollers. Based on the preliminary study, a prototype was fabricated in collaboration with M/s BSIL, Nagpur. All the components were standardized, fabricated, and assembled. The prototype was tested using seed cotton at a particular moisture content, and fibre quality parameters of both baled and unbaled samples

were analysed using HVI and AFIS systems. The results showed the fibre damage, generation of short fibre and neps during baling process.

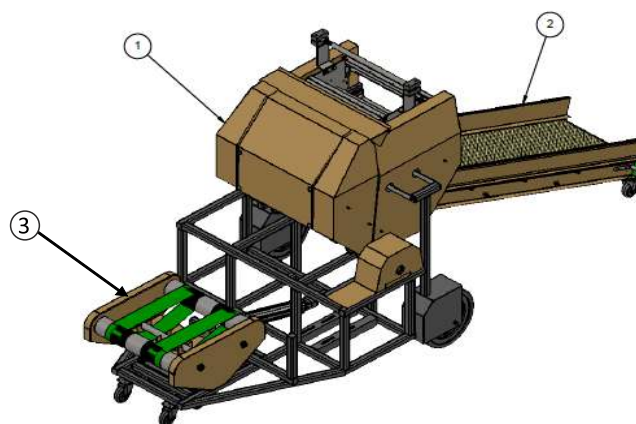


Fig. 2.6.2 Three-dimensional view of the proposed prototype showing (i) compaction chamber (ii) seed cotton conveyor (iii) bale wrapping mechanism (iv) wheels for mobility

In addition to in-house prototype testing, two industrial trials were conducted using high-capacity belt-driven silage baling machines. During the first trial, 35-40 kg bales of seed cotton were produced, and the parameters recorded were as follows: seed cotton moisture content was 10.20% w.b., baling time was 1.5 min/bale, and bulk density was 200-220 kg/m³. In the

second trial, a higher-capacity machine producing up to 70 kg bales was evaluated. Both the systems featured adjustable bale weight settings and a dual-stage plastic wrapping mechanism. The trials demonstrated that both small and medium-sized bales of seed cotton could be produced efficiently while optimizing certain parameters. The fibre quality parameters of baled (B) seed cotton were comparable with those of the control (C) unbaled samples.

Based on trial observations and technical discussions with the project partners, it was

decided to evaluate the machine performance using plain rollers made of aluminium and mild steel, accordingly fabricated, fitted and tested. However, adequate compaction was not achieved with plain rollers. This strengthened the hypothesis that grooved rollers are more suitable for effective seed cotton compression. Accordingly, future efforts will focus on fabricating the prototype with parameters like roller configuration, compaction efficiency, compression mechanism, etc.

2.6.3 Development of smart foods, bio-composites, green packaging and bio energy from agro biomass

(1014584 [NASF]– PI: Dr. A. Arputharaj)

Fire & Water Retardant Banana Fibre Board:

Fire-retardant banana fibre boards were fabricated using ammonium dihydrogen orthophosphate (ADHP) at concentrations of 0%, 20%, and 30% with a material-to-liquor ratio of 1:10. Treated fibers were bonded using chitosan and hot-pressed at 160 °C under 120–125 bar pressure. Increasing ADHP concentration significantly improved density, reaching 761.3 kg/m³ at 30% ADHP compared to 367.5 kg/m³ in the control board. Water absorption decreased from 470% in the control to 236% in the 30% ADHP-treated board, while thickness swelling reduced from 271% to 154%. Thermo gravimetric analysis has confirmed improved thermal stability and enhanced char formation, indicating better flame-retardant behaviour of the developed board. SEM observations revealed improved surface roughness and interfacial bonding, and FTIR analysis confirmed chemical interaction between ADHP, chitosan, and banana fibres. Although density and moisture content met IS-3087 standards, water absorption, thickness swelling, and mechanical strength required further improvement.

To enhance moisture resistance, additional water-retardant treatments were applied. Among Asian Touchwood coating, candle wax coating, and Eco Guard New treatment, the Eco Guard New fibre-level application showed superior results. Water absorption decreased to approximately 30% and thickness swelling to about 10%, demonstrating excellent dimensional stability. The combination of 30% ADHP and Eco Guard New successfully produced fire- and water-retardant boards (Fig 2.6.3) suitable for packaging and panel applications.

Banana Cotton Blended textiles: The study also optimized banana fibre processing for cotton-blended yarn production (Fig 2.6.4). Alkali treatment with 4% NaOH at 70 °C for 45 minutes effectively removed lignin and other impurities. Hydrogen peroxide bleaching ensured uniform whiteness without strength loss. Silicone softening provided improved flexibility and handle. Raman, FTIR, and microscopic analyses confirmed successful chemical modification, good fibre compatibility, and uniform blending. Overall, the study highlights banana fibre as a promising eco-friendly alternative for composite and textile applications.



Fig 2.6.3 Fire and water retardant banana fibre board



Fig. 2.6.4 Cotton blended banana fiber yarn

2.6.4 Development of high performance woven protective gloves and seamless knitted gloves for industrial uses

Seamless Gloves from Recycled Para-Aramid/Cotton for Industrial Safety:

Sustainable and high-performance cut-resistant seamless glove using recycled para-aramid/cotton blended yarns was developed for industrial safety applications. Recycled para-aramid fibres were successfully blended with cotton in different proportions and converted into seamless knitted gloves with improved comfort, durability, and protective performance. Performance evaluation as per EN and ISO standards demonstrated that the 70/30 recycled

(1015052 [NTTM]– PI: Dr. G. Krishna Prasad)

para-aramid/cotton blend exhibited optimum performance, achieving Level C cut resistance, Level 4 limited flame spread, and Level 1 contact heat resistance. The developed glove (Fig 2.6.5) also showed enhanced thermo-physiological comfort through improved moisture vapour transmission and reduced peak heat flux, making it suitable for prolonged industrial use. This technology provides a cost-effective, eco-friendly, and value-added utilization pathway for recycled high-performance fibres in protective textile applications.



Fig. 2.6.5 Recycled para-aramid/cotton blends

Development of STF-Latex Coated Multilayer Protective Fabrics and Seamless Gloves for Industrial Cut-Resistant Applications: A high-performance protective glove technology was developed using multilayer woven fabrics (Fig. 2.6.6) and seamless knitted structures coated with Shear Thickening Fluid (STF) and nitrile latex (Fig. 2.6.7) for industrial cut-resistant applications. The multilayer structures were engineered using UHMWPE, cotton, recycled para-aramid/cotton blend, and cotton/nylon core-spun yarns with optimized construction parameters to achieve enhanced mechanical protection and wearer comfort. STF formulations containing nano-silica and nanocellulose were applied through a

controlled padding process followed by nitrile latex coating for improved interfacial bonding and durability. Performance evaluation as per the European Committee for Standardization EN 388 standard demonstrated significant improvement in abrasion, puncture, and cut resistance. The developed cotton/nylon core-spun multilayer structure achieved abrasion resistance up to 7,399 cycles, while STF-treated para-aramid gloves exhibited cut resistance up to 14.5 N. The optimized technology demonstrated strong potential for industrial safety applications requiring lightweight, durable, and high cut-resistant hand protection.



2.6.6 Para-aramid Glove



2.6.7 Para-aramid + STF+ Nitrile coated Glove

2.6.5 Development of portable instrument to measure cotton quality at farm gate and textile industries

(RGSTC 2025/295 – PI: Dr. P. Jagajanantha)

Cotton quality directly influences its market price and end-use performance in the textile industry. Key parameters such as colour (as measured by reflectance R_d and yellowness $+b$), moisture content, micronaire, and trash content play a vital role in determining fibre

value. However, existing assessment methods such as High-Volume Instruments (HVI) are laboratory-based, expensive, and time-consuming, making them unsuitable for on-site evaluation. To address this gap, a portable cotton quality measurement instrument is

being developed for use at the farm gate, ginning units, and textile industries. The device integrates advanced sensing technologies, intelligent algorithms, and a compact design to enable rapid, on-site measurement of critical cotton quality parameters including Rd, +b, moisture, micronaire, and trash.

The instrument is designed to be user-friendly, allowing farmers, buyers, ginners, and quality control personnel to easily assess cotton quality without the need for sample transportation or laboratory delays. This innovation provides a practical and cost-effective solution for field-level cotton quality assessment, empowering

stakeholders with timely information for better pricing, processing, and utilization.

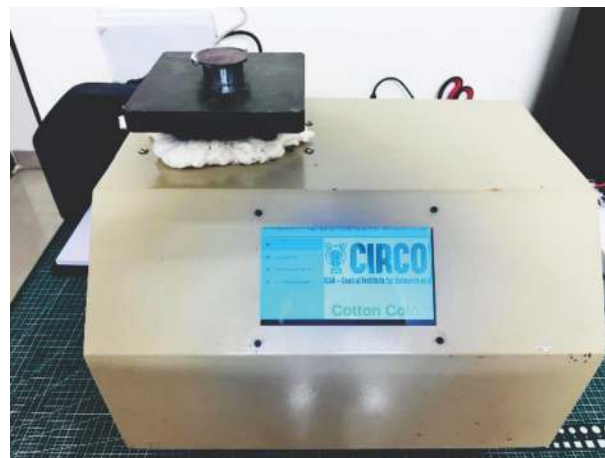


Fig.2.6.8 Cotton Colour Grading System

2.6.6 Study to develop standard test method for determination of lint and trash content of cotton

(TXD 0272 [BIS]– PI: Dr. P. Jagajanantha)

Accurate assessment of lint and trash content in cotton is essential for determining fibre quality, processing performance, and market value. The existing standard method like IS 4871, require larger sample quantities and longer testing time, which limit testing efficiency in modern cotton quality evaluation systems. To address this challenge, the present study focused on developing an optimized test method that reduces sample size without compromising accuracy and reproducibility.

Inter-Laboratory test : The project evaluated cotton samples of medium, long, and extra-long staple categories across multiple laboratories including Cotton Association of India, Northern India Textile Research Association, South India Textile Research Association and Ahmedabad Textile Industry Research Association (Fig 2.6.9). Comparative analysis was carried out using three specimen sizes — 100 g, 50 g, and 25 g — to study their influence on lint percentage, trash percentage, and invisible loss.

The most significant achievement of the study was the validation that the conventional 100 g specimen is not always necessary for reliable trash estimation. Statistical analysis revealed that the 50 g specimen produced results comparable to the 100 g sample across most fibre categories, with no significant variation. In contrast, the 25 g specimen consistently showed higher trash values and reduced reliability, indicating over estimation due to inadequate representation of the cotton sample.



Fig.2.6.9 Multi laboratory test for the trash analysis carried out at SITRA, Coimbatore

2.6.7 Characterization and utilization of paddy straw and other agro residues for conversion into pellets for co-firing in thermal power plants (TPP)

(1013645 [National Biomass Mission]– PI: Dr. A. Arputharaj)

Characterization of Paddy Straw Pellets:

Total 21 paddy straw varieties (2023 crop) collected from different regions of the country were analyzed. The highest ash content (24.42%) and acid insoluble ash (18.38%) were observed in PB-1692 from Haryana, whereas the lowest ash (12.87%) and acid insoluble ash (9.46%) were recorded in CR-212 and PR-126 from Punjab, respectively. Manganese content varied widely, ranging from 60.73 ppm to 1075.68 ppm. The gross calorific value (GCV) ranged from 3262 Cal/g to 3890 Cal/g, indicating considerable regional and varietal variation in fuel quality.

Prototype Torrefaction plant: A 50 kg/h torrefaction prototype was successfully established at GTC, Nagpur, and systematic torrefaction studies were conducted on paddy straw at 250°C, 280°C, and 310°C with residence times of 30, 40, and 50 minutes. Torrefaction significantly improved fuel properties. Moisture content of torrefied biomass reduced to 3.5–7.9%, while volatile matter decreased from 57.8% to about 22–24% with increasing severity. Fixed carbon content increased from 24.7% to a maximum of 43.1%, enhancing combustion stability. The GCV improved from 3770 Cal/g to 4410 Cal/g at higher temperature and residence time. However, mass yield decreased from 64% to 34.1% due to progressive devolatilization, indicating improved energy density at the cost of reduced solid yield.

Similar torrefaction trials were conducted on

cotton stalk at 250°C, 270°C, and 290°C. Moisture content ranged between 3.9–7.5%. A marked reduction in volatile matter (from 62% to 37%) and corresponding increase in fixed carbon content was observed with increasing temperature and residence time, confirming improved fuel characteristics.

Pilot Level Torrefaction Plant: A 200 kg/h pilot-level torrefaction plant was designed and fabricated at Vidarbha sales (Fig.2.6.10). The unit has been manufactured and installation is in progress. Trials on cotton stalk are being conducted at different temperatures, and process optimization are being analyzed.

Crop experiments with biomass ash: Pot trials were conducted on cotton crop at GTC, Nagpur to evaluate the use of cotton stalk ash in combination with compost and recommended dose of fertilizers (RDF). The experiment was conducted up to 100 days after sowing (DAS), with plant growth parameters recorded at 25-day intervals. A total of 180 plant samples (leaves, shoots, and roots) were collected and analyzed for macro- and micronutrients using ICP-MS. Essential nutrients such as K, Ca, Mg, Fe, Zn, Cu, Mn, and B were evaluated, and no heavy metal accumulation was detected in any treatment. Application of ash at 25% showed growth comparable to RDF and compost treatments. However, ash levels beyond 25% negatively affected plant growth parameters, indicating that moderate ash incorporation is beneficial while higher concentrations may adversely influence crop performance.



Fig.2.6.10 Fabricated pilot scale torrefaction unit (200 kg/h)

2.6.8 Safety of Cottonseed protein isolate for human consumption: Validation through in-vitro toxicological studies

(IGSTC/SING-2024/01654 [IGSTC]– PI: Dr. Manoj Kumar)

The Indo-German Science & Technology Centre (IGSTC) funded project aimed at evaluating the safety of Cottonseed Protein Isolate (CSPI) through advanced in-vitro toxicological assays. The one-month research visit from November 07 to December 06, 2025 at the Institute of Food and One Health, Leibniz University Hannover, Germany, enabled hands-on exposure to cell

culture, cytotoxicity assessment, MTT assay standardization for CSPI. The visit significantly strengthened research capacity, provided access to state-of-the-art infrastructure, and set the foundation for further advanced research in the domain.

2.6.9 Agri-Business Incubation Centre at ICAR-CIRCOT, Mumbai.

(1007815 [NAIF]– PI: Dr. Ashok Kumar Bharimalla)

Incubation: During the period 18 new entrepreneurs were admitted for incubation. Twelve incubations are in progress.

Kshitij programme: The programme was launched in 2025-26 to provide the expert guidance for the start-ups under the ABI scheme. For the Kshitij Programme around 15 outreach activities were organised and 119

applications were received from the potential entrepreneurs.

Revenue Generation: The revenue generation through the ABIC store via sale of products is Rs. 27.19 Lakhs. The centre has earned a revenue of Rs. 10.39 lakhs through its incubation services and technology commercialization activities.

2.6.10 Remunerative approaches for agriculture and allied sectors rejuvenation (RAFTAAR) Agri Business Incubator

(1011105 [RKVY]– PI: Dr. Ashok Kumar Bharimalla)

RIC Meetings Conducted for Cohort 9 Startups: RAFTAAR Incubation Committee held for 9th COHORT on February 17-18, 2025 for 20 startups (2 under UDAY and 18 under ANKUR). The CIRCOTR-ABI team presented mentoring

support, details, including 42 mentoring sessions and 8 expert lectures. Based on evaluation, 01 UDAY and 11 ANKUR startups were recommended for Selection by the Selection and Investment Committee (SIC).



Fig.2.6.11 Meeting of the RAFTAAR incubation committee for selection of the Start ups

Inauguration of 8th Cohort – Incubation Workshop (RKVY-RAFTAAR SAIP): ICAR-CIRCOT R-ABI, Mumbai inaugurated the Incubation Workshop for the 8th Cohort on March 27, 2025 under the RKVY-RAFTAAR Startup Agri-Incubation Program (SAIP). In total 14 startups selected under UDAY (pre-seed) and ANKUR (seed-stage) components participated in the cohort. The startups are working in areas such as bioinoculants, agri-drones, sustainable packaging, AI-based dairy tools, tribal women empowerment, and agri-waste management. The 15-day incubation programme (March 27 to April 21, 2025) included expert sessions, one-to-one mentoring, and workshops on business planning, product validation, marketing, investment readiness, and legal compliance.

Sessions were conducted in both online and offline mode. The programme aimed to strengthen early-stage agritech startups and promote sustainable and scalable agribusiness solutions in line with national priorities.

Selection and Investment Committee Meeting for Cohort 9 Startups: The Selection and Investment Committee (SIC) Meeting for the 9th Cohort of CIRCOT R-ABI, Mumbai was held on April 25, 2025 in hybrid mode under the RKVY-RAFTAAR Startup Agri-Incubation Program (SAIP) and Agri-entrepreneurship Orientation Programme (AOP). A total of 14 startups (12 seed stage and 2 pre-seed stage) presented their proposals before the committee. After detailed evaluation, 7 startups were recommended for seed-stage funding with a total sanctioned amount of ₹142 lakhs. The

seven selected startups presented their business ideas, including biodegradable maternity pads from banana fibre, chitosan extraction from seafood waste, Solkadhi pre-mix powder, eco pest-trap devices, Khadi-based products, improved onion seed variety, and cotton bale compression solutions.

COHORT 10 Overview: In total 293 applications were received for the 10th Cohort of the CIRCOT R-ABI (Arambh – 27; Uday – 113 and Ankur – 153). The screening and selection process is underway for the 10th Cohort.

Review Meeting with Ministry of Agriculture & Farmers Welfare: A review meeting of the ICAR-CIRCOT R-ABI Project was held on July 18, 2025 with officials of the Ministry of Agriculture & Farmers Welfare to assess the progress and performance of the incubator. The achievements of CIRCOT R-ABI in promoting agri-based entrepreneurship and innovation were reviewed and appreciated by the Ministry. During the meeting, the 'Udaan' Newsletter (January–June 2025) and the Monthly Startup Progress Reports for May and June 2025 were formally released.



Fig.2.6.12 Review meeting of the RKVY-RAFTAAR Agribusiness Incubator at New Delhi

2.7. Consortia Research Platform (CRP) on Natural Fibres

2.7.1 Development and evaluation of pre-grooved chrome leather roller and automatic deep-cut grooving for double roller gin

(CRP-CIRCOT 11– PI: Dr. Seshrao Kautkar)

Periodic re-grooving of the ginning rollers is necessary after every 2–3 days to maintain the rough surface of the periphery of rollers and to facilitate efficient ginning. The challenges faced in re-grooving is, it is tedious, time and labour consuming operation that requires 3 labours and 20–30 minutes of time adding to operational complexity and downtime in

ginning machines.

Automatic deep-groove forming machine: An automatic deep-groove forming machine (Fig. 2.7.1) was developed and evaluated under the project during reporting period. The dimensions and technical details of the machine are depicted in Table 2.7.1. The major

parts of the machine include body frame, chuck holding assembly, cutter blade, rail, gear motor, roller holding and pressing mechanism, cutter drive height adjustment assembly, cutter cooling system, control panel, caster wheel, handle, etc. The developed machine is used to

form grooves from 2 mm to 25 mm deep. The machine is fully automatic and programmed for ease in operation. It requires only one operator, hence saves extra cost and time involved in re-grooving of ginning rolls.

Table 2.7.1. Technical specifications of automatic deep-groove forming machine

Parts/ components	Specifications	Remark
Dimensions, mm (L*W*H)	2900*1058*1613	IS 4923 Hollow square section tubes
Chuck holding assembly (self-centred chuck)	3-jaw	To hold and rotate the roller during grooving (chuck, drive shaft, bearing)
Height adjustment assembly	3HP	Provided for cutter rotation
Gear motor for timing pulley	2 HP	Revers & forward motion of cutter drive
Cutter (Ø125mm)	Teeth: 30	For roller grooving, Tungsten carbide
Caster wheel	6" & 4 Nos	For easy machine moment
Tail Stock Assembly	To hold the other end of the roller	
Control panel	Interface to monitor and control machines operation/safety	

The performance evaluation of the developed machine was conducted and it was found that the machine takes 1 minute to form one groove on the periphery of the roller. Accordingly, it takes 16 minutes for grooving machine to form

16 grooves against 30-40 minutes of time by three manual labourers. The groove dimensions and depth were found to be uniform throughout the periphery of the roller.

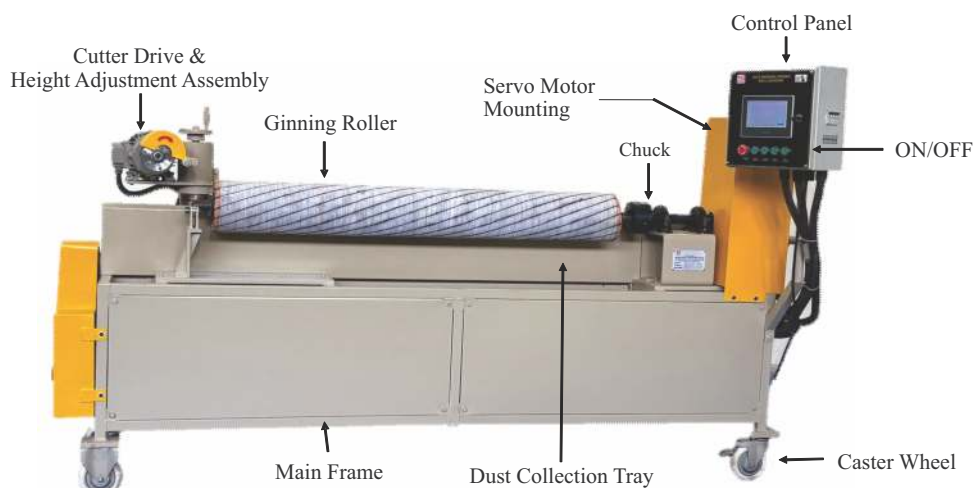


Fig. 2.7.1 Automatic deep-groove forming machine

The lint output was observed to be 70.0 kg/hour/gin when using deep grooved rollers in a commercial ginning setup, compared to 63.0 kg/hour/gin with conventional 2 mm deep grooved rollers resulting in a gain of 7.0

kg/hour/gin. This technology is compatible with all types of chrome leather roller ginning machines, including those with varying roller lengths and diameters.

2.7.2 Optimization of spinning process parameters for Cotton/Hemp blends and develop value added products

(CRP-CIRCOT 12– PI: Dr. T. Senthil Kumar)

The process protocol outlines the development of cotton/cottonized hemp blended yarn spinning to create sustainable, high-performance textiles. Hemp (*Cannabis sativa* L.), known for its moisture management, UV protection, and eco-friendliness, faces limited use in conventional ring spinning due to its coarse texture and high non-cellulosic content (25–37%). To enhance its spinnability, the fibre was chemically treated for effective degumming and fibre separation, resulting in a 25–31% weight reduction, 14.43 g/tex bundle strength, and 1.35 tex fineness.

Cottonized hemp fibre, developed at ICAR–NINFET, Kolkata, was blended with cotton in a 70/30 ratio and spun into 30s Ne yarn, achieving a CSP of 2243 and single yarn

strength of 16 g/tex, compared to 3098 CSP and 20.3 g/tex for 100% cotton yarn. Trials with blend ratios of 80/20, 60/40, 40/60, and 20/80 indicated that higher hemp content led to reduced yarn strength. The 80/20 and 70/30 blends were optimal for maintaining spinnability and yarn quality in finer counts. Blends beyond 40% hemp were unsuitable for finer yarns in conventional spinning systems, highlighting the importance of optimized blend ratios for industrial application. This protocol facilitates the industrial adoption of hemp in mainstream spinning systems, promoting diversification in natural fibre use and reducing dependency on synthetic fibres.

2.7.3 Development of Biorefinery Process for Conversion of Cotton stalks into bio-ethanol

(CRP-CIRCOT 13– PI: Dr. K. Pandiyan)

Cotton stalks were collected, chipped, and ground into a particle size of 1-2 mm. The biomass was pretreated with two methods, Deep Eutective solvents (DES) and Steam explosion. In DES method, Choline chloride was added to the biomass in combination with lactic acid orglycerol in the molar ratio of 1:2. Five grams of cotton stalk was added with 50 ml DES (1:10ratio) and kept at 100 °C for 3 h in a shaking water bath at 120 rpm. The treated samples were centrifuged and the residue was

washed until neutral pH was achieved, dried at 60 °C and analysed for lignin content.

In steam explosion method, five grams of cotton biomass were added with 0.27% sulphuric acid (0.05M) at 1:15 ratio and incubated in the following conditions: Pressure – 10 bar; Temperature– 200 °C; Time – 30 min. The pretreated samples were analysed for compositional changes using Fourier Transform Infra-red (FTIR) and standard protocols. The results revealed that the lignin

content was significantly removed (33.7% in ChCl + LA) in DES pretreated biomass as compared to raw biomass.

After pretreatment, the samples were enzymatically hydrolysed using commercial enzymes for production of reducing sugars which ultimately will be utilized by yeast for ethanol production. The findings showed that the TRS content was maximum in biomass

treated with ChCl + LA (213.5 ± 3.0 mg/g dry substrate).

The various parameters for enzymatic saccharification need to be optimised for achieving maximum recovery of total reducing sugars from lignocellulosic biomass, which will be fermented with yeast strains to obtain bio-ethanol

2.7.4 Bioprocessing of natural fibres and agro residues for production of oligo-saccharides and lignin-derived aromatics.

(CRP-TNAU 02– CCPI: Dr. A.S.M. Raja)

Production of Oligo saccharides and lignin-derived aromatics: Attempts have been made to produce cello- oligosaccharides from the cotton lint and banana fibres. Cello-oligosaccharide (COS) production was carried out by enzymatic hydrolysis of banana fiber and cotton lint by suspending 5% biomass (w/v) in citrate buffer (50 mM, pH 5.0), at 40 IU mL⁻¹ cellulase load. Enzymatic hydrolysis after desorbing β -glucosidase was then carried out at 45°C with shaking at 150 rpm for 24 h. The produced COS was further concentrated using a freeze-drier at a pressure of 50 Pa and a temperature of -50°C (Labfreez Instruments, Changsha, Hunan, China). Under optimized conditions, the cello oligosaccharide yield was reported to be 159 g kg⁻¹, 309 g kg⁻¹, and 30 g kg⁻¹ for lab-scale banana fiber, pilot-scale banana fiber, and cotton lint, respectively. COS obtained from the pilot scale was freeze-dried to yield 266.4 g kg⁻¹ of powder.

Purification of Cello-oligosaccharides using the yeast fermentation method: A yeast-based purification approach was employed using active *Saccharomyces cerevisiae* (approximately 10⁶ CFU mL⁻¹). The yeast culture was harvested by centrifugation at 6000 × g for 5 min at 4 °C and washed with 0.85% (w/v) NaCl solution to remove residual medium components. The

resulting wet yeast biomass was suspended in 30 mL of the enzymatic hydrolysis sample, incubated for 24 h, and quantified by HPLC. The results showed that purification of COS using yeast increased 9.88-fold, yielding 79 mg g⁻¹ (3.95 mg mL⁻¹), compared with the control.

Production and upscaling of the xylo-oligosaccharides (XOS) at optimized conditions: Xylo-oligosaccharide (XOS) production was initially evaluated at laboratory scale using the optimized process parameters. Under these conditions, the XOS concentration obtained was 2.58 mg mL⁻¹, yielding 64.5 mg g⁻¹, indicating effective enzymatic conversion of xylan at the bench scale. Upon scaling up the process to pilot-scale operations, a substantial improvement in XOS yield was observed, with the concentration increasing nearly tenfold to 25.52 mg mL⁻¹, demonstrating the robustness and scalability of the optimized production strategy. Furthermore, subsequent freeze-drying of the pilot-scale XOS hydrolysate resulted in a marked concentration enhancement, reaching 55.49 mg g⁻¹. This significant increase highlights the effectiveness of downstream processing in concentrating XOS and improving product recovery. Overall, the results confirm that scale-up and freeze-drying significantly enhance XOS yield,

supporting the feasibility of the process for large-scale, value-added production of oligosaccharides.

Conversion of Oligosaccharides into Starch:

For production of starch from oligosaccharides, the *Endoglucanase*, *Endoglucanase II* and *Cellobiohydrolase* enzymes are identified for

converting oligosaccharides into glucose and one glucose-1-P. For converting glucose-1-P to Amylose (Starch), another set of enzymes viz. cellobiose phosphorylase (CBP) and potato α -glucan phosphorylase (α -GP) are identified. The production of enzymes is in process.

2.8. Completed Research Projects

2.8.1 Evaluation, optimization, and standardization of different types of lint cleaners used in ginneries

(MP 101 [Core Area I] - PI: Dr. Varsha Satankar)

In this study, two types of cleaning cylinders—spike type and spade type—were evaluated under three-cylinder and six-cylinder configurations. The cleaning cylinder speed was varied from 250 to 475 rpm, and the effect of these parameters on cleaning efficiency, lint loss, and fibre quality was analyzed using a full factorial design. The results revealed that the spike-type six-cylinder lint cleaner, operated at 275 rpm, provided the highest cleaning efficiency of about 35% with acceptable lint loss (around 1.1%) and moderate neps generation. Fibre characteristics such as upper half mean length, micronaire, and strength remained within acceptable limits, while the brightness (Rd value) improved considerably after cleaning. The optimization model achieved a

desirability index of 0.947, indicating high reliability of this operating condition.

The study also found that spade-type cleaners were gentler in action and caused less fibre damage, although their cleaning efficiency was slightly lower (around 26%). For spade-type cleaners, higher operating speeds (450–475 rpm) yielded better performance without significant deterioration in fibre parameters. Thus, for routine ginnery operations, spike-type cleaners are recommended where higher cleaning efficiency and improved brightness are desired, whereas spade-type cleaners are preferred for long-staple or premium-quality cotton where fibre preservation is more critical.

2.8.2 Development of standard protocol for determination of ginning percentage of seed cotton

(MP 104 [Core Area I] - PI: Dr. Sharmila Patil)

Salient Findings

- The moisture absorption-desorption behaviour of seed cotton, lint and seed samples of five CICR varieties (CNA-1028, PKV 081, Ajeet 155, Ankur Kirti, Moksha) and five trade varieties (NCS-2778, RCH-659, Harish, ATM, Isha gold-30) was studied at $25 \pm 2^\circ\text{C}$ temperature and 30-90% relative humidity.
- The process protocol for conditioning of seed cotton to attain the desired moisture content is optimized.
- The effect of moisture content of seed cotton on ginning percentage (GP) was

studied using Lilliput gin. The study established that increasing moisture content from 4% to 24% led to a gradual decline in GP across all varieties, with the highest GP at 4% and the lowest at 24%. Excess moisture also resulted in higher lint moisture losses, increased invisible losses, and seed crushing, particularly beyond 16% moisture, affecting ginning efficiency and GP accuracy.

- The effect of sample weight on GP showed that the sample weight has no significant ($P < 0.05$) effect on GP. However, smaller sample sizes (25 and 50 grams) exhibited higher variability in GP determination, emphasizing the importance of using

larger sample weights (100 grams or more) for more reliable results.

- Based on experimental findings related to the conditioning of seed cotton, the effect of moisture content on GP, and the effect of sample weight on GP; the process protocol for determining the GP of seed cotton was optimized.
- A proposal on “Method for determination of ginning outturn (GoT)/ginning percentage (GP) of seed cotton using laboratory gin” is prepared as per the Bureau of Indian standards (BIS) new proposal format.

2.8.3 Assessment of processing losses in Indian cotton ginning industries

(MP 105 [Core Area I] - PI: Dr. Manoj Kumar Mahawar)

The study successfully achieved its objective of identifying and assessing the ginning industries across all major cotton-growing zones. A total of 11 ginning industries were surveyed, covering diverse conveying mechanisms and operational practices. Comprehensive data collection on seed cotton weights, processing losses, and fibre quality revealed significant variations across industries and regions.

It was observed that the processing loss in the industries ranged between 0.88-1.95% (pneumatic conveying), and 0.56-1.38% (belt conveying) mechanism. The trash content in the lint sample varied from 1.16-3.10%, depending

on pre-cleaning practices and the type of cotton processed.

The study also emphasized the importance of adopting best management practices to minimize processing losses and improve lint quality. Such practices include, installation of pre-cleaners, avoiding mixing of cotton varieties, regular maintenance of the ginning machinery, installation of humidification systems, adoption of CIRCOT technologies (deep grooved rollers and Kawdi openers), and structured training programs for ginning operators.

2.8.4 Evaluation and Improvement of Heat Generating Smart Textile Products

(MP 107 [Core Area II] - PI: Dr. P. Jagajanantha)

ICAR-CIRCOT, Mumbai has developed smart fabrics which helps to generate heat and used in various applications like cold weather garments, Ice-sportswear, bike riders, trekking and mountain climbers. This is a cotton based smart fabric which will be of less weight and

more comfortable for regular use and easy journey.

The developed conductive yarn was tested at various ambient temperature ranges (20°C - 32°C). The conductive yarn was tested with

respect to the change in length, voltage as well as for the temperature raise with respect to the change in time.

The cotton/carbon based electrically conductive yarn was interwoven with cotton fabrics and

they were used for thermal comfort clothing, to generate maximum temperature of 70°C to the surface. Depending upon the product, it can be controllable with a user-friendly electronic thermostat system.

2.8.5 Development of bio nano composite films using extrusion process

(II 05 [Core Area II] - PI: Dr. Sharmila Patil)

Salient Findings

- Bio nanocomposite films comprising of ternary blend of Polybutylene adipate terephthalate (PBAT), thermoplastic starch (TPS) and polylactic acid (PLA) reinforced with nanocellulose (NC) were successfully manufactured by melt compounding in twin screw extruder followed by blown film extrusion
- Grafting of maleic anhydride improved the compatibility between polymer blend and NC, resulting in uniform dispersion of the NC with no agglomeration
- NC reinforcement (1-3%) significantly improved the elasticity modulus (toughness) and water vapor barrier of the composite films, without affecting their tensile strength
- The optimized nanocomposite formulation is PBAT/TPS/PLA/NC: 60/20/15/5/1.
- Optimized extrusion process parameters are:
 - Preparation of TPS: Temp:110-120°C, Screw speed: 120 rpm
 - Melt compounding: Temp: 140-160°C, Screw speed: 100 rpm
- Blown film extrusion: Temp:125-135°C, Screw speed: 100 speed, nip roller speed: 3 rpm
- The optimized nanocomposite films have mechanical properties comparable to Low Density Polyethylene (LDPE).
- The developed nanocomposite films have good potential as a packaging material for perishables.

2.8.6 Development of AI based prediction model for yarn quality characteristics

(QE 113 [Core Area III] - PI: Dr. N. Shanmugam)

Salient Findings

- Cotton fibre parameters namely UHML, Strength, micronaire, elongation and uniformity were used in the development of models for predicting highest spinnable count. Models were developed using regression method and AI based machine learning algorithms. Automl GBM algorithm was found to give least root mean square error of 3.0 and highest coefficient of determination (R^2) of 0.97 when compared with generalized linear regression and deep neural network. The percentage reduction of error is up to 85% in comparison with multiple regression model depending upon error parameter used for evaluation of model
- RKM (Resistance per Kilometre), is the breaking load in grams divided by yarn fineness expressed in tex. It is also called as

tenacity with a unit of grams/tex. RKM is one of the yarn properties, which if predicted in advance, can decide the type of cotton to be used in making the particular yarn.

- A machine learning model was developed for predicting cotton yarn Resistance per Kilometre (RKM) from cotton fibre properties using Automated Machine Learning (AutoML).
- A dataset of 176 samples, spanning a range of count values from 12s to 100s Ne, was used along with cotton characteristics such

as Upper Half Mean Length (UHML), micronaire, bundle strength, Uniformity index and elongation.

- The voting ensemble algorithm outperformed traditional regression models, yielding a normalized root mean squared error of 0.10357 and significant reductions in MAE, MAPE, and RMSE by 37.6%, 38.1%, and 53.8%, respectively.
- The study identified UHML as the predominant variable influencing RKM predictions.

2.8.7 Development of viscose-based marker fibre for the traceability of cotton

(QE 114 [Core Area III] - PI: Dr. A. Arputharaj)

To enhance the traceability of cotton, viscose marker fibres were developed using transition and lanthanide series metals. These fibres were synthesized by treating viscose with specific metal salts, ensuring their incorporation into the fibre matrix. The marker fibres were then blended with cotton fibre at 0.3% (OWM) and processed into slivers. The presence of marker metals in the blended fibres was confirmed using multiple analytical techniques. A colour reaction

provided a preliminary indication of metal incorporation, while X-ray fluorescence spectroscopy (XRF) enabled qualitative and semi-quantitative analysis. Further, Inductively Coupled Plasma Mass Spectrometry (ICP-MS) precisely quantified metal concentrations, ensuring the fibres' traceability. This study demonstrates a novel approach to cotton authentication by integrating marker elements into viscose fibres.

2.8.8 Isolation of gossypol from cottonseed and its evaluation as a botanical fungicide

(CH 102 [Core Area IV] - PI: Dr. Kanika Sharma)

Salient Findings

- Developed the process protocol for the recovery of pure gossypol acetic acid (GAA) crystals from cottonseed meal. The process includes three steps: Optimization of process parameters (temperature, solvent: solid ratio, reflux time, pH, solvent type) for the extraction of gossypol from cottonseed meal; optimization of purification parameters and optimization of crystallization process.
- UV-Visible and FTIR characterization of obtained gossypol acetic acid crystals was carried out in which both showed similar spectra and peaks.
- Developed HPLC/MS/MS method for the qualitative and quantitative determination of gossypol.
- The obtained gossypol acetic acid crystals showed 97% purity as analysed using

High performance liquid chromatography (HPLC).

- DPPH and ABTS radical scavenging activity of standard GAA and gossypol acetic acid crystals obtained from CSM was carried out in which both showed excellent

scavenging activity for DPPH and ABTS radicals with an IC₅₀ around 7 and 2 µg/mL respectively.

- In antibacterial and in vitro anticancer assays, standard gossypol acetic acid showed excellent inhibitory activities.

2.8.9 Efficacy evaluation of ICAR-CIRCOT nano-sulphur as fertilizer formulation for different field crops

(II 06 [Core Area IV] - PI: Dr. Manoj Kumar Mahawar)

Nanosulphur was synthesised using the established chemo-mechanical process protocol using elemental sulphur as raw material having 90-95% yield. The average particle size of the suspension ranged between 300-500 nm.

'Efficacy evaluation of ICAR-CIRCOT nano sulfur on plant growth, yield and quality of onion and garlic' was conducted following factorial randomized block design with 12 treatments at ICAR-DOGR Rajguru Nagar during 2022-23. For garlic, the highest average yield (13.55 t/ha) was observed with the 100% NS treatment, followed closely by bentonite sulphur (13.04 t/ha), while the lowest was with the 75% NS treatment (12.40 t/ha). In case of onion, the 100% nanoNS treatment again resulted in the highest average yield (62.50 t/ha), followed by bentonite sulphur (59.60 t/ha), while the control had the lowest yield

(53.90 t/ha). These results suggest that the 100% nanoNS treatment was most effective for enhancing both garlic and onion yields, with bentonite sulphur also showing consistent yield improvements over the control.

The efficacy of nano-sulphur as fertilizer formulation was evaluated on Cotton and Soybean at VNMKV, Parbhani during 2023-24 season and on soybean cv. Phule Sangam cultivated on an inceptisol soil at MPKV Rahuri in the Kharif season during July 2023. The study highlighted that although there is no significant increase in the yield parameters of the crops, but it was observed that similar yield parameters were recorded with less dosage of nano sulphur. To draw some conclusive results, extensive multi-location trials may be conducted on sulphur responsive crops and sulphur deficit soils through AICRP mode.

Chapter 3

Technology Management

3.1 Intellectual Property Management

Institute Technology Management Unit (ITMU) is entrusted with the responsibility of the protection of intellectual property of the technologies developed in the Institute. The ITMU is also accountable for the evaluation of commercial values of different consultancy

projects and also the licensing of technology. During this year, one patent was granted, two patents have been filed, three consultancies have been handled and processed through Institute Technology Management Unit (ITMU).

Patent Grant: (01)

Patent Number & Granted on	Technology/ Innovation	Inventor Name
566951 29.05.2025	Woven fabric architecture for enhanced particle filtration in face mask fabric	Dr. G. T. V. Prabu

Patent Applied: (02)

Date & Appln. No.	Technology/ Innovation	Inventor Name
15.7.2025 202521067478	A Process for the Production of Gossypol Acetic Acid	Dr. Kanika Sharma
22.7.2025 20252106821	Finished woven fabric and a process for its preparation	Dr. A. S. M. Raja

Copyright Granted: (01)

- (i) Algorithm for electronic seed sowing module [Copyright registration certificate No. SW-2025021436]. Copyright Office, Government of India. (Dr. Mansuri, S. M., Scientist)

Copyright Applied: (01)

- (i) Copyright titled "BENLiP: Bagging-based Ensemble Model to Identify Nucleosome and Linker Positioning has been filed in which Dr. Himanshushekhar Chaurasia, Scientist (Computer Application), is involved as an author.

Contract Research Project initiated: (01)

Title of Project	Name of Industry Partner
Development of Cotton Ginning Roller with Rubber Discs	M/s. Rubber Engineers Enterprises, Kerala

Consultancy Projects (03)

Title of Project	Name of Industry Partner
Behavioural Study of Farmers including harvest and disposal pattern of cotton across Northern, Central and Southern Zones	M/s. The Cotton Corporation of India Limited, Mumbai
Evaluation and analysis of fibre quality and trash content of cotton samples of Fully Pressed (FP) Bales.	
Mechanical Cotton Harvesting and Processing	M/s. Fast Retailing India

3.2 Technology Certification:

In the year 2025, under the Agricultural Engineering Division SMD, the following three technologies from ICAR-CIRCOT were acknowledged and honoured with certificates, during the 97th Foundation Day of ICAR held at the National Agricultural Science Complex, New

Delhi, during July 16, 2025. During the same event, the technology, 'Continuous Flow Cottonseed Dryer', was released and it is among the 'top 5 technologies' from the Agricultural Engineering SMD.

Three Technologies certified are,

S. No.	Title	Category
1.	Continuous Flow Cottonseed Dryer	Technology
2.	Industrial Multilayer Woven Cut-Resistance Gloves	Technology
3.	Spinning of novel blends of cotton/hemp for production of sustainable textiles	Process Protocol

3.3 Technology Commercialization:

Particulars of MoU	Licensee	Date of Signing of MoU
To commercialize the 'Seed Cotton Collection & Storage Bag with Anti-microbial Finish & Technology' to reduce contamination and trash in cotton during collection and storage	M/s. Farmtek Solutions, Nashik	07-Jan-25
	M/s. Micro Sales India, Nashik	07-Jan-25
	M/s. United Cotton Extract Pvt. Ltd., Malegaon	07-Jan-25
	M/s. Prakash Agro Plast, Nashik	07-Jan-25

Title of Project/ particular of MoU	Licensee	Date of Signing of MoU
Nano-Zinc Suspension Production Technology to improve agricultural practices by utilizing the Nano-Zn suspension formulation to enhance plant growth in the field	M/s. Relegare Agro Life Bio Science Pvt. Ltd., Ahmednagar	07-Jan-25
Technical Textile Reinforced Rubber Composite Sheet for making "ICAR Flexi Check Dam" (Renewal)	Forech Mining and Construction International LLP, New Delhi	06-Jan-25
High Absorbency and Biodegradable non-woven based pad	M/s Zzwick Hygiene, New Delhi	16-Jan-25
Commercialization of 'ICAR-CIRCOT Green Crematorium' (Renewal)	M/s. Vidarbha Sales, Nagpur	16-Jan-25
M/s Mega Bags, Pune for licensing "Nanosilver-Finished Antimicrobial Cotton Textile" Technology	M/s Mega Bags, Pune	19-Sep-25
Development of Miniature Ginning Machine	M/s. Precision Tooling Engineers, Nagpur	03-Dec-25
Deep Groove Roller Forming Machine	M/s Bajaj Steel Industries Limited, Nagpur	03-Dec-25

3.4 Technology Incubation

ICAR-CIRCOT provides technology incubation support through its Agri-Business Incubation (ABI) Centre funded under National Agriculture Innovation Fund (NAIF) and the

RKVY-RAFTAAR Agribusiness incubator funded by Department of Agriculture & Farmers Welfare. The start-ups incubated during the period are,

Sr. No.	Incubatees	Technology
1.	M/s. Michanologia Enterprises Pvt. Ltd.	Farmer friendly household ginning machine
2.	M/s. WeWake Indigreen Pvt. Ltd.	Agro waste based advanced alternative material to replace single use plastic products
3.	M/s. Siddaganga Bio Products.	Creating and promoting Areca Leaf Plate
4.	M/s. Dhanaaj Agritech Pvt. Ltd.	Seed Cotton Compacting Machine
5.	M/s. Longshore Technologies Private Limited.	Advanced Chemo-Enzymatic Process for Chitosan & Protein Hydrolysate Production

Sr. No.	Incubatees	Technology
6.	M/s. Aruheal Solutions Private Limited	Production of maternity pads from banana pseudo stem pulp
7.	M/s. ASAIR Green-O-Lands Pvt. Ltd.	Economic empowerment of tribal women (Kani Tribe - Pechiparai) through value addition of Therali leaves (Wild Cinnamon)
8.	M/s. Kannalware products	Biodegradable Single use Sugarcane Crockery
9.	M/s. Kolba Organics LLP	Disposal & Value Addition of cotton ginning waste in Vermicomposting
10.	M/s. Farm Gulp Private Limited	Value addition to Areca Wash Liquid(AWL) for the production of Pan Masala Kattha and Industrial Tannins
11.	M/s. Innovate IPM Solutions LLP	Eco Pest-Trap: Comprehensive pest control device for farmers
12.	M/s. Bhosale Brothers LLP	Innovative eco-friendly cardboard packaging box for pot-plants
13.	M/s. Cotton guru Textiles LLP	Utilizing Residues Juxtaposing Agriculture To empower tribal women and smallholder cotton farmers in Maharashtra
14.	Centre For Sustainable Crafts and Research	Decani sheep wool's (Ghongadi) using in a medical textile industry. Creating sustainable economic opportunities for handloom artisans
15.	M/s. Optimum Data Analytics Pvt Ltd	Artificial Intelligence Based Quality Assessment of Rice Seeds
16.	M/s. M J Bhadra Design Pvt Ltd	Development design and selling of Khadi Apparels
17.	Sh. Samir Sharma, Nitin, Kunal	Suncarbon Soil Enhancer & suncarbon Saarthi
18.	M/s. Sargenic Ventures Private Limited	Innovative Mahua Seed based body butter product

R-ABI Incubation: Total of 173 start-ups are incubated and 81 of them were sanctioned Grant in Aid to the tune of Rs.12.35 lakhs. The Cohort wise performance is given in the table below.

Particulars/COHORT	1	2	3	4	5	6	7	8	9
Start-ups Incubated	16	26	12	19	09	13	21	35	22
No of Startups selected for grant in aid	14	12	08	07	05	05	09	14	07
Grant in aid Amount sanctioned (Rs Lakhs)	144.5	153	97.75	102.5	65	78	200	253	142

Chapter 4

4. Skill Development & Capacity Building

4.1 Capacity building of Staff

Institute staff are trained as per the devised training needs assessment plan to keep pace with the latest technological advancements in the relevant fields. The employees were trained in premier institutions to learn the cutting-edge technologies, and project management methodologies. Impact assessment of the training programme is also carried out after a period of one year to analyse the outcome. The percent realization of trainings planned during the annual year 2025-26 was 324% & for the financial year 2024-25 was 98%. Scientists

underwent training in diversified fields like Laboratory Management System, Data Analysis using R, NABL Laboratory Assessor's, Executive Development Program on Protective Textiles and Advances in Hydrogen Production for Clean Energy and Environment.

During the current year (2025-26), the employees are regularly trained in various advanced areas as per the designed Annual Training Plan (ATP).

Table 4.1 Skill Development of Institute Staff during 2025 (January to December 2025)

Programme Title	Duration	Venue	Name(s)
<i>Scientific Staff</i>			
Training on "Optimizing Lab Productivity with HPLC Best Practices and Empower Features"	February 7, 2025	WATERS, Mumbai	Dr. Manoj Kumar Dr. Kanika Sharma
Masterclass session on ""Standards and Regulations in the Field of Textiles"	February 14, 2025	Bureau of India Standards (BIS), at Bharat Mandapam, New Delhi	Dr. G. Krishna Prasad
6-day MDP on "Priority Setting, Monitoring and Evaluation (PME) of Agricultural Research Projects"	February 17-22, 2025	ICAR-NAARM, Hyderabad	Dr. G. T. V. Prabu
Executive Development Program on "Protective Textiles" (online mode)	February 24-28, 2025	Indian Technical Textile Association (ITTA), Mumbai.	Dr. T. Senthilkumar Dr. G. Krishna Prasad

Programme Title	Duration	Venue	Name(s)
Orientation Workshop on "Mission Karmayogi" organized by DARE/ICAR	February 27, 2025	NASC Complex, New Delhi.	Dr. T. Senthilkumar
ICAR sponsored 10 days short course on "Advances in Hydrogen Production for Clean Energy and Environment"	March 17-26, 2025	ICAR-CIAE, Bhopal	Dr. Kanika Sharma
Five-day 'Orientation Training Programme for Newly Recruited Scientists'	28 July to 01 August 2025	ICAR-CIRCOT, Mumbai	Dr. Shekh Mukhtar Mansuri Dr. Sujan Adak
Workshop on XMLisation of Standards and Online Standards Development	August 22, 2025	Mumbai Branch Office, Bureau of India Standards (BIS), Mumbai	Dr. N. Shanmugam Dr. A. S. M. Raja Dr. Ashok Kumar Bharimalla Dr. A. Arputharaj Dr. T. Senthilkumar Dr. G. Krishna Prasad Dr. P. Jagajanantha
Measurement Uncertainty: Chemical & Mechanical Measurements"	August 21-22, 2025	IRMRI, Mumbai	Dr. N. Vigneshwaran
Laboratory Quality Management System and Internal Audit.	September 12, 2025	NITS, Noida	Dr. Manoj Kumar Dr. Shekh Mukhtar Mansuri
Advances in Applications of Nanotechnology	10-14 November, 2025	ICAR-CIRCOT, Mumbai	Dr. Ajinath Dukare
Technical Staff			
Five-day 'Orientation Training Programme for Newly Recruited Technical Personnel'	07-11 July 2025	ICAR-CIRCOT, Mumbai	Shri. Mukesh Onkar Shri. Bhaskara Rao Vazragiri Shri. Sunil Kumar Shri. Sandeepkumar Yadav Shri. Snehal Gajanan Lonare Shri. Abhishek Awasti

Programme Title	Duration	Venue	Name(s)
			Shri. Visal Malav Shri. Rameshwar Jakhar Shri. Ronal Tarachand Gajbhjye Shri. Amar Verma Shri. Amit Kumar Shri. Bipin Kumar Shri. Rajesh Kumar
Measurement Uncertainty: Chemical & Mechanical Measurements"	August 21-22, 2025	IRMRI, Mumbai	Shri Rajesh Kadam Shri Mukesh Onkar
Training Programme on Photography	November 8, 2025 to January 10, 2026 (Weekend batch)	National Institute of Photography, Dadar, Mumbai	Shri Anand R. Jadhav
<i>Administrative Staff</i>			
Module II training for the Assistant recruited under Direct Recruitment quota	April 28 to May 2, 2025	ICAR-CIFE, Mumbai	Mr. Siddhesh S. Divekar Md. Aadil
Workshop on Office Procedure and Noting & Drafting	September 1-3, 2025	ISTM, New Delhi	Mr. Sainath N. Sahane Mr. Siddhesh S. Divekar Mr. Sudhakar M. Chandanshive
Workshop on preparation of expenditure finance committee / Standing finance committee	September 1-2, 2025	ISTM, New Delhi	Mr. Sumit Saurabh
Capacity Building of the Head of the Office on Administration, Establishment, Vigilance & Financial Matters	October 13-15, 2025	ISTM, New Delhi	Mr. Yogesh Ram Pathare
Rashtriya Karmayogi Jan Seva Training Programme – Phase II	October 06-08, 2025	ICAR-CAZRI, Jodhpur	Smt. Trupti P. Mokul

4.2 HRD Achievements

Table 4.2 HRD Targets & Achievements for April 2024 to March 2025

<i>Category</i>	<i>Total No. of Employees</i>	<i>No. of training planned for each category as per ATP</i>	<i>No. of employees undergone training</i>	<i>% realization of training</i>
Scientist	29	8	12	150
Technical	59	14	20	140
Admn. & Finance	19	5	5	100
SSS	21	6	0	0
Total	128	33	37	98.21

Table 4.3 HRD Targets & Achievements for April 2025 to March 2026

<i>Category</i>	<i>Total No. of Employees</i>	<i>No. of training planned for each category as per ATP</i>	<i>No. of employees undergone training</i>	<i>% realization of training</i>
Scientist	29	8	27	337
Technical	61	16	49	306
Admn. & Finance	16	4	16	400
SSS	18	5	15	300
Total	124	33	107	324

4.3 Achievements: iGOTKarmayogi Training

In line with the directives issued by the ADG (HRM), ICAR, and the Department of Personnel and Training (DoPT), Government of India, it has been mandated that all regular employees of ICAR institutes must complete 6 courses of APAR mandatory course and 26 hours of different model in iGOTKarmayogi platform. The initiative aims to build institutional capacity by equipping staff with the latest knowledge, digital competencies, and best practices required for the effective and efficient discharge of their duties.

In this regard, the scientific, technical, and administrative staff of the institute have proactively participated in various online

training courses offered through the iGOTKarmayogi portal. These courses have been designed to support continuous learning and skill enhancement across disciplines.

Through these training programmes, staff have gained valuable knowledge and practical skills that enable them to adapt to technological advances, adhere to best practices, and contribute more effectively towards the objectives of the institute and the nation. This initiative has not only strengthened institutional human resource capacity but also enhanced the overall quality of service delivery within the organization.

4.4 Achievements: International Exposure

Dr. Manoj Kumar, Scientist, completed one-month research stay with Prof. Esatbeyoglu Tuba at the Institute of Food and One Health, Dept. of Molecular Food Chemistry and Food Development at Gottfried Wilhelm Leibniz University, Hannover, Germany, during November 07 to December 06, 2025, under the

project “Safety of Cottonseed Protein Isolate for Human Consumption: Validation through in-vitro Toxicological Studies”, awarded to him by Indo-German Science and Technology Centre, New Delhi under the Small Immediate Need Grant (IGSTC-SING).

4.5 Achievements: In-house HRD activities

- Ginning Training Centre, Nagpur organized a lecture/meet on topic “Artificial Intelligence mein Hindi Ka Yogdan” (in Hindi), in hybrid mode on March 27, 2025. Staff of GTC, Mumbai HQs and regional units attended.
- ICAR-CIRCOT Agri Business Incubation Centre organized lecture on, “Patent filing process and different fee structure”, on April 02, 2025.
- A lecture, entitled 'Recent Trends in Green Composites', was delivered by Dr. S. P. Borkar, RAC Member and Professor, Department of Textile Manufactures, VJTI, Mumbai, during the 31st RAC on April 17, 2025, attended by all scientific and technical staff (STO & above).
- A seminar on NPS and UPS was conducted on April 22, 2025 as part of the Institute's HRD activities for staff members covered under the scheme. About 20 staff attended the meeting.
- A two-day awareness programme conducted by Dr. R. K. Sharma, Lead Assessor of ISO 9000-2015, NABL Lead Assessor of ISO/IEC-17025, 17043 & 17034 on the topic, 'ISO 17043: Conformity Assessment – General Requirements for the Competence of Proficiency Testing Providers' and 'ISO 17034: General Requirements for the Competence of Reference Material Producers', was organized on May 21-22, 2025 and attended by scientific and technical staff of the institute.
- Hindi workshop on “ए आई उपकरणों की सहायता से अनुवाद एवं टंकण”, (Artificial Intelligence se Anuvaad va Tankan), was conducted on June 30, 2025 by GTC, Nagpur, for all staff of GTC and in online mode for all staff of HQ, Mumbai and all QEU of the Institute.
- A fire-fighting demonstration cum awareness programme was conducted in the institute premises on July 15, 2025 for all staff.
- Training for latest version of e-Office was conducted for all staff by the ICT Unit, ICAR on July 17, 2025.
- Vigilance Awareness Training Programme on December 29, 2025, wherein Shri Neeraj Tanwar, Under Secretary (Vig-I), ICAR (Hqrs.), New Delhi, delivered lecture on, “CCS (Conduct) Rules” and “Overview of Vigilance including CCS (CCA) Rules”.
- Lecture Titled, “कार्यालयीन कार्य हिंदी में आर्टिफिशियल इंटेलिजेंस का उपयोग”, delivered by Shri Deepak Chouhan, Official Language Hindi Officer from Western Coalfield Limited, Nagpur, in virtual mode on December 29, 2025.

4.6 Skill Development Programmes organized for Stakeholders

Sr. No.	Programme Title	Period	No. of Participants	Participant's Profile
<i>Organised at ICAR-CIRCOT, Mumbai</i>				
1.	Training on Smart Textiles and 3D Printing	January 6-8, 2025	16	SCSP Students
2.	Spectroscopic and Chromatographic Techniques for Material Characterization	February 24-27, 2025	12	Students, Academicians
3.	Training Program on “Best Production Practices, Processing of Cotton and Value Addition to Cotton By-produce	February 28 to March 4, 2025	10	Agriculture officers from the Department of Agriculture & Farmers Empowerment, Krishi Bhavan, Bhubaneswar, Odisha
4.	Smart Textiles and its Application	March 26-28, 2025	21	Students of Woxsen School of Arts and Design, Hyderabad, Telangana,
5.	Training cum Exposure visit on Best production practices, Processing of cotton and Value addition to cotton by-produce	April 14-18, 2025	10	Officials from The Directorate of Agri and Food Production, Odisha
6.	Training cum Exposure visit on Best production practices, Processing of cotton and Value addition to cotton by-produce	April 21-25, 2025	10	Officials from The Directorate of Agri and Food Production, Odisha
7.	Grading, Procurement & Processing of Cotton	July 21-25, 2025	15	Junior Commercial Executives of Cotton Corporation of India Ltd.
8.	Cotton Grading, Procurement and Marketing	August 4-8, 2025	12	New Recruits of Cotton Corporation of India Ltd.
9.	One-day refresher course on “Characterization Techniques of Cotton Textiles, Auxiliaries, Water & Effluent”	August 8, 2025	11	Staff of M/s. Gini Silk Mills, Boisar, MH

Sr. No.	Programme Title	Period	No. of Participants	Participant's Profile
10.	Basic Molecular Biology and Genome Editing Techniques	September 16-19, 2025	11	Students
11.	Advances in Applications of Nanotechnology	November 10-14, 2025	14	Students
12.	Pulp & Paper Technology	November 24-27, 2025	11	Students, Industry staff
13.	Electrospinning for Nano fibre Production	December 10-12, 2025	9	Students, Academicians

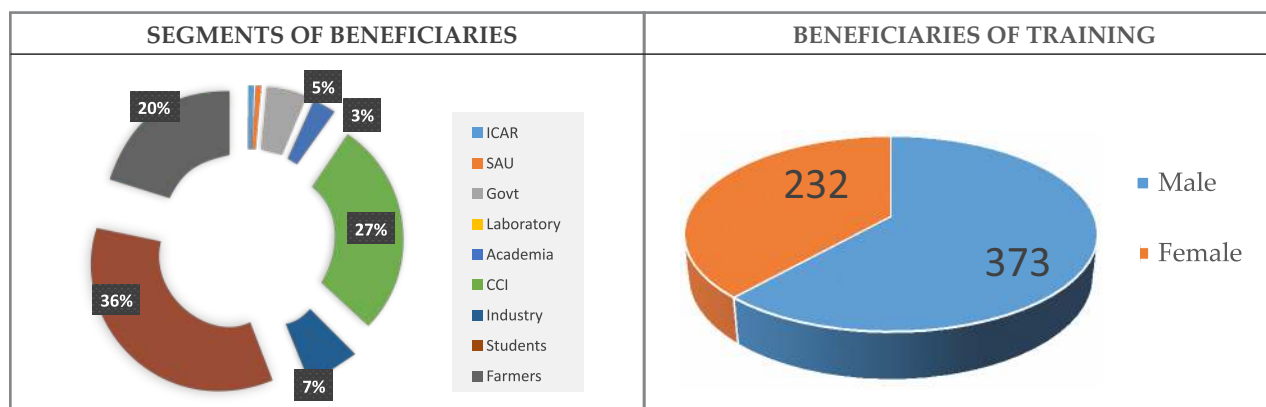
Organised at Ginning Training Centre (GTC), Nagpur

14.	Cotton quality parameters and value addition to its by-produce	February 20-22, 2025	16	Farmers
15.	Cotton quality parameters and value addition to its by-produce	February 24-27, 2025	22	Farmers
16.	Training program for students under SCSP Scheme on "Ginning Technology and Cotton Grading"	March 3-5, 2025	50	Students
17.	Training program on "Best Production Practices, Processing of Cotton and Value-addition to Cotton By-produce"	March 3-8, 2025	23	Farmers of Global Green, Subarnapur, Odisha
18.	Training program on "Best practices for organic cotton production and post-harvest processing of cotton"	March 20-22, 2025	25	Progressive farmers from Sabuja Sathi FPCL, Subarnapur, Odisha Farmers
19.	Best Production Practices, Processing of Cotton, and Value Addition to Cotton By-products	June 16-21, 2025	24	Farmers
20.	Best Production Practices, Processing of Cotton, and Value Addition to Cotton By-products	June 25-30, 2025	21	Farmers

Sr. No.	Programme Title	Period	No. of Participants	Participant's Profile
21.	Double Roller Ginning Technology & Basics of Cotton Grading	July 7-12, 2025	18	Industry staff, Traders, Ginners, Agripreneurs
22.	Grading, Procurement & Processing of Cotton	July 21-25, 2025	29	Junior Commercial Executives of CCI
23.	Grading, Procurement and Processing of Cotton	August 4-8, 2025	29	Junior Commercial Executives of CCI
24.	Grading, Procurement & Processing of Cotton	August 18-22, 2025	29	Junior Commercial Executives of CCI
25.	Grading, Procurement and Processing of Cotton	September 8-12, 2025	24	Junior Commercial Executives of CCI
26.	Grading, Procurement and Processing of Cotton	June 16-21, 2025	29	Junior Commercial Executives of CCI
27.	Double Roller Ginning Technology and Cotton Grading for students	November 11-13, 2025	100	Students

Skill Development Programmes at Navsari Agricultural University (NAU), Surat

28.	Training programme sponsored by SMART District Implementation Unit (DIU), Akola on "Basics of cotton grading and processing" in collaboration with NAU, Surat	March 3-7, 2025	11	Industry staff
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4.7 Education

The Institute is affiliated to Mumbai University for offering Ph.D. programme in Microbiology. At present, for the academic year 2025-26 three students are registered/admitted for undergoing the Ph. D. (Microbiology) at ICAR-CIRCOT.

Ph. D. Scholars

- Ms. Anagha Pawar, registered for Ph.D. (Science) in Microbiology with the research topic 'Biogenesis of Hydrogen using Cotton Biomass by Dark Fermentation and Microbial Electrolysis Cell'
- Ms. Anam Shaikh, registered for Ph.D. (Science) in Microbiology with research topic 'Innovative Approach for Carbon Sequestration using Microbial Carbonic Anhydrases Immobilised on Nanocellulose'
- Ms. Amruta Vilas Gadade, registered for Ph.D. (Science) in Microbiology with the research topic 'Development and Evaluation of Herbal based antimicrobial Nano coating formulation for cotton textiles in wound healing management.'

Internship Programme:

Sr. No.	Students (Affiliation)	Guide	Duration
1.	· Ms. Shraddha Chandrakant Mahamulkar · Mr. Shubham Birajdar (Pillai College of Arts, Commerce and Science, New Panvel)	Dr. Kanika Sharma and Dr. Manoj Kumar	03 Months dissertation program (completed in January 2025)
2.	· Ms. Syed Tuba · Mr. Rohit Sunar (GN Khalsa College, Matunga)	Dr. Ajinath Dukare,	03 Months dissertation program (completed in May 2025)
3.	· Mr. K. N. Nivas · Mr. Siva Prasad T. N. (SRM Easwari Engineering College, Chennai)	Dr. P. Jagajanantha	Internship project on "3D Printed Hybrid Orthosis for Fracture Immobilization" (May 27, 2025 to July 18, 2025.)
4.	· Ms. Priyanka Singh (ITM University, Gwalior)	Dr. Pandiyan	One month internship (July 1 - 31, 2025)



Training on Smart Textiles and 3D Printing during January 6-8, 2025



Training on "Best Production Practices, Processing of Cotton and Value Addition to Cotton By-produce" for agriculture officers from the Department of Agriculture & Farmers Empowerment, KrishiBhavan, Bhubaneswar, Odisha during February 28-March 4, 2025



Training cum Exposure visit on Best production practices, Processing of cotton and Value addition to cotton by-produce during April 21-25, 2025



Training programme on "Grading, Procurement and processing of Cotton" for Junior Commercial Executives of Cotton Corporation of India Ltd during August 2-8, 2025



One-day refresher course on "Characterization Techniques of Cotton Textiles, Auxiliaries, Water & Effluent" on August 08, 2025 for industry personnel of M/s. Gini Silk Mills, Boisar, Maharashtra.



Basic Molecular Biology and Genome Editing Techniques Training during September 16-19, 2025

Chapter 5

5. Linkages & Collaborations

ICAR-CIRCOT maintains linkages with various organizations at national and international level in the domain of research, education, skill development and extension. Linkages with stakeholders helps to foster research, enhance technology assessment and refinement, capacity building and fasten the transfer of technology from lab to the land.

ICAR-CIRCOT, a technology partner of the AICRP on Cotton and Principal investigator of Quality Research, is linked to ICAR institutions and State Agricultural University involved in the cotton breeding programme. The institute is also a part of the Central Variety Release Committee and the cotton varieties release should fulfil the quality norms set by the institute.

Memorandum of Understanding (MoUs) were signed with different industries and with individuals for development of and commercialization of Institute technologies for cotton processing and value addition to by-products. The Institute has taken necessary initiative to include the industrial stakeholders at the project initiation stage. This has led to development of linkage with industrial stakeholders through signing of Memorandum of Understanding (MoU) for carrying out collaborative research and machinery development in public private partnership mode.

Institute is the nodal centre for implementation of the Consortia Research Platform (CRP) on Natural Fibres. Under this project the linkage has been established with institutes working in the field of natural fibres such as ICAR-

NINFET, Kolkata, ICAR-CIPHET, Ludhiana, ICAR-CIAE, Bhopal, ICAR-CSWRI, Avikanagar, and TNAU, Coimbatore.

Quality Evaluation (QE) units of the Institute are located within the premises of other institutes and agricultural universities in the country. Other than functioning as extension wings, these units also facilitate linkages and collaboration with host institutes. Agri-Business Incubation (ABI) Centre at the headquarters that works towards promotion of the entrepreneurship based on institute technologies has created linkage with budding entrepreneurs, industries and other institutions working towards promotion of innovative ideas into new enterprises

5.1 Research & Academic Collaboration

- MoU was signed between ICAR-CIRCOT, Mumbai Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir for collaborative research of *mutual interest, entrepreneurship development, agri-startup incubation, knowledge and information sharing, joint seminars and conferences, training programmes, and sharing of research facilities* on June 20, 2025.
- MoU was signed with Indian Institute of Information Technology, (IIIT), Nagpur on September 03, 2025 for Collaborative Research on *Development of AI-Based Portable Device for Non-Destructive Measurement of Ginning Percentage*.
- MoU was signed between ICAR-CIRCOT,

Mumbai and the Cotton Textiles Export Promotion Council (TEXPROCIL), Mumbai, on October 07, 2025. at the 4th Global Cotton Conference in New Delhi, for the *promotion of Kasturi Cotton Bharat and technology development for traceability in the cotton value chain.*

- NDA was signed between ICAR-CIRCOT, Mumbai and the Mahindra and Mahindra Limited, Mumbai on November 10, 2025 for *testing and improvement of perceived quality on fabrics, leather and leatherette.*
- MoU signed with M/s Rubber Engineers Enterprises, Kerala on December 03, 2025, for Collaborative Research on *Development of Cotton Ginning Roller with Rubber Discs*

5.2 Technology Licensing/ Commercialization

- MoU with Forech Mining and Construction International LLP, New Delhi was signed for *'Technical Textile Reinforced Rubber Composite Sheet for making ICAR Flexi Check Dam'* on January 06, 2025.
- Four MoUs signed with leading industry partners to address challenges in *cotton seed collection and storage*, viz: M/s. Farmtek Solutions, Nashik, M/s. Micro Sales India, Nashik, M/s. United Cotton Extract Pvt. Ltd., Malegaon, and M/s. Prakash Agro Plast, Nashik, on January 07, 2025.
- MoU with M/s. Relegare Agro Life Bio Science Pvt. Ltd., Ahmednagar, for the licensing of *'Nano-Zinc Suspension Production Technology'*, on January 07, 2025.
- MoU with M/s Zzwick Hygiene, New

Delhi was signed for technology Licensing of *'High Absorbency and Biodegradable non-woven based pad'* on January 16, 2025

- MoU with M/s Vidarbha Sales, Nagpur was renewed on January 16, 2025 for commercialization of *'ICAR-CIRCOT Green Crematorium'*.
- Memorandum of Understanding (MoU) with M/s Mega Bags, Pune on 19 September 2025 for the licensing of its technology on *Nanosilver-finished antimicrobial cotton textiles.*
- MoU signed with M/s Bajaj Steel Industries Limited, Nagpur for technology transfer of *Deep-Groov Roller Forming Machine* on December 03, 2025.
- MoU renewed with M/s Precision Tooling Engineers, Nagpur for technology transfer of *Development of Miniature Ginning Machine* on December 03, 2025.

5.3 Incubation Services: MoA with Start-Ups

Seven MoA's were signed with following startups by ICAR-CIRCOT R-ABI on June 24, 2025.

- M/s. Greinventek Pvt. Ltd. for development of custard apple pulp extraction machine.
- M/s. ASAIR Green-O-Lands Pvt. Ltd. for economic development of tribal women through value addition of therali.
- M/s. R.A.C. CHOCOLATE IND LLP., for frugal fruit chocolate.
- M/s. CottonGuru Textiles LLP. for utilizing residues juxtaposing agriculture to empower tribal women and smallholder cotton farmers in Maharashtra.

- M/s. Michanologia Enterprises Pvt. Ltd. for Farmer Friendly Household Ginning Machine.
- M/s. Shreel-Surya Research Pvt. Ltd. for phytase producing multifunctional bioinoculant.
- M/s. Sanrajya Agro India Pvt. Ltd. for sugarcane planting machine.

Eleven MoA were signed with startups under the ICAR-CIRCOT R-ABI Project for incubation and funding support on December 3, 2025.

- M/s. L K Vet Care Pvt. Ltd., Pune, Maharashtra for Digital Artificial Insemination in livestock management
- M/s. Bhosale Brothers LLP., Pune, Maharashtra for Eco-friendly and resilient corrugated packaging solutions
- M/s. Sargenic Ventures Pvt. Ltd., Pune, Maharashtra for Innovative Mahua seed based body butter cream
- M/s. Alunt Agro Products Pvt. Ltd., Pune, Maharashtra for Development of process for delaying the aging for better nutritional value of black garlic
- M/s. Longshore Technologies Pvt. Ltd., Palghar, Maharashtra for Advanced Chemo-Enzymatic Process for Chitosan Protein Hydrolysate Production
- M/s. Aruheal Solutions Pvt. Ltd., Jalgaon, Maharashtra for Production of maternity pads using banana fibre
- M/s. Eatsy Food and Agro Pvt. Ltd., Kolhapur, Maharashtra for Manufacturing of ready to use Solkadhi pre-mix powder
- M/s. Sandip Pyaz Bio Organics, Pune, Maharashtra for Invented desi onion seed variety "Sandip Pyaz" with higher yield,

superior shelf life, disease tolerant and cost-effective.

- M/s. Innovate IPM Solutions LLP, Jalgaon, Maharashtra for Eco Pest-Trap: Comprehensive pest control device for farmers.
- M/s. Dhanaaj Agritech Pvt. Ltd., Parbhani, Maharashtra for Compression of cotton bales through new mechanised way.
- M/s. MJ Bhadra Designs Pvt. Ltd., Mumbai, Maharashtra for Development, design and selling of Khadi apparels.

5.4 Commercial Services

5.4.1 Consultancy (3)

- An MoU was signed with the Cotton Corporation of India Ltd. on December 10, 2025, for consultancy on Evaluation and analysis of fibre quality and trash content in cotton samples from fully pressed (FP) bales.
- MoU signed with M/s The Cotton Corporation of India Limited, Mumbai on December 03, 2025, for consultancy on Behavioural Study of Farmers, including harvesting and cotton disposal patterns across Northern, Central, and Southern Zones.
- MoU signed with M/s Fast Retailing India Material Corporation Pvt. Ltd., New Delhi on December 03, 2025, for Consultancy on Mechanical Cotton Harvesting and Processing.

5.4.2 Commercial Testing

ICAR-CIRCOT is one of the world's renowned cotton testing laboratories and it is the only referral laboratory in our country for testing cotton textiles. Testing laboratories of CIRCOT has accreditation from National Accreditation

Board for Testing and Calibration Laboratories (NABL), Ministry of Science and Technology, Government of India, New Delhi since 1999. CIRCOT's state of the art laboratories have facilities for testing over 178 tests on different textile materials. These facilities are open to all stake holders including textiles mills, government departments and academic institutions. The institute is one of the two Indian laboratories recognized by the Bureau International pour la Standardisation des Fibres Artificielles (BISFA), an international

association of man-made fibre producers, for testing man-made fibres.

Commercial testing of samples of textile items viz., fibre, yarn, fabric, garments, made-ups and textile auxiliaries are done at ICAR-CIRCOT. Testing is done for various physical, mechanical, chemical parameters. All these tests are done through the Test House. Test House is a single window facility to receive samples for testing, accepting testing charges and also to dispatch test results to the party.

Table 5.1 Number of paid samples tested during 2025 (January – December)

Test Centre	No. of samples tested
ICAR-CIRCOT HQ, Mumbai	12650
Ginning Training Centre, Nagpur	25519
Quality Evaluation Unit, Dharwad	1987
Quality Evaluation Unit, Guntur	1891
Quality Evaluation Unit, Sirsa	4960
Quality Evaluation Unit, Surat	2495
Quality Evaluation Unit, Coimbatore	5438
Total	54940

Table 5.2 Clientele of commercial testing services

Test	Clientele
Fibre testing	Research Stations: Agricultural Research Station, Banswara; RARS, Nandyal; RARS, Warangal; NAU, Bharuch; C.R.S., Nanded; Regional Research Station, Faridkot, PAU Regional Research Station, Bhatinda, PAU; ARS, Adilabad; Cotton Research Station, Veppanthattai; ARS, Sri Ganganagar; CRS, JAU, Junagadh; Main Cotton Research Station, NAU, Surat SAU's & Institutions: UAS Raichur; University of Agricultural Sciences, Dharwad; MPKV, Rahuri; O.U.A.T., Odisha; Telangana State Agricultural University, Mudhole; Dr. PDKV Akola; HAU, Hisar; B.M. College Of Agriculture, Khandwa; ICAR-National Research Centre for Banana, Tiruchirappalli; The Dean, College of Community Science, Tura

Test	Clientele
	• Seed Companies: Kaveri Seed Company Limited, Secunderabad & Aurangabad; Mahyco Private Limited, Jalna; Pancha Ganga Seeds Pvt. Ltd., Aurangabad; Shriram Bioseed Genetics - Hyderabad • Private firms & Traders: Crystal Crop Protection Limited, Telangana & Aurangabad; Baltic Testing India Pvt. Ltd, Mumbai; Cotecna Inspection India Pvt Ltd, New Delhi; Cu Inspections & Certifications India Pvt. Ltd.; Commodity Inspections, Navi Mumbai; Inspectorate Griffith India Pvt. Ltd, Indore; Khushi Traders, Mumbai; Rallis India Limited, Bangalore; SGS India Private Limited, Mumbai; Trident Limited, Punjab • Associations: National Textile Corporation Ltd., Mumbai; Cotton Association of India, Mumbai; The Cotton Corporation of India Ltd, Navi Mumbai • Chetna Organic Agriculture Producer Company Ltd, Telanagana
BET Surface Area Analysis	• Central Institute of Fisheries Technology, Navi Mumbai • Greenjoules Pvt.Ltd., Pune • Vijay Sabre Safety Pvt. Ltd., Mumbai
ICP-MS	• Abhitech Energycon Limited, Thane • ICAR-National Research Centre for Banana, Tiruchirapalli • Indokem Limited, Ambernath • Institute of Chemical Technology, Mumbai • Sri Kaliswari College (Autonomous), Sivakasi, Tamil Nadu • Coastal Conservation Foundation, Mumbai • ICAR- Central Institute of Fisheries Education, Mumbai • Elephinstone College, Mumbai, M.G. Road, Fort • R.C.F Ltd, Chembur • CSIR-NEIST, Assam
FTIR	• Devashish Polymers Pvt Ltd, Dadra and Nagar Haveli and Daman and Diu • Central Institute of Fisheries Technology, Navi Mumbai • ICAR-CIFT, Vashi, Navi Mumbai • Indokem Limited, Thane • Prachi V. Bhatia, Mumbai
Particle Size	• Amvigor Organics Pvt Ltd, Mumbai • ICAR-Central Institute of Fisheries Technology, Navi Mumbai • ICAR-Indian Institute of Pulses Research, Kanpur • Indokem Limited, Mumbai • Sanjay R. Tiwari, Pdeu, Sot, Gandhinagar, Raisan, Gujarat • Vijay Sabre Safety Pvt. Ltd., Mumbai

Test	Clientele
UPF	• AAU, Jorhat, Assam • Shivaji University, Kolhapur
Q- Max (Warm/cool Feeling)	• CMC Textile Pvt Ltd, Silvassa • M/s Ninepetals LLP, Mumbai • M/s. Jacquard Fabrics India Pvt Ltd,, Coimbatore • Pluss Advanced Technology Ltd, Bawal • Saan Mattress Ticking Private Limited, Haryana • Sanghmitra Navalgund, Assistant Professor, Mumbai • Silvassa Global Synthetics Pvt Ltd, Dadra & Nagar Haveli • Sleep Management Pvt Ltd, Rajasthan
SEM	• ICAR-Central Institute of Fisheries Technology, Navi Mumbai • Analytical Science, Bengaluru • Horticulture College & Research Institute, Periyakulam
Full Test Kawabata	• VJTI College Mumbai • ICAR-NINFET, Kolkata • St Thomas College of Engineering & Technology, Kerala • Adrde, Agra • Wool Research Association, Thane
Lyophilization Test	• D.Y. Patil College, Navi Mumbai
Full Test Kawabata	• Aerocom Cushions Pvt Ltd, Nagpur • Akar Engineers, Thane • Amardeep Udyog, Mumbai • CIVIBIT LAB LLP, Chh. Sambhajinagar • Commissionerate, Social Welfare Pune • Hon. Balasaheb Thackeray Agri-Business & Rural Transformation Project (SMART), Amravati • Kanchan Associates, Nashik • Kontak Comforts Pvt Ltd, Ahmednagar • Maharashtra State Powerlooms Corporation Limited, Navi Mumbai • Medii Heal Solutions, Nagpur • New Century Filaments Pvt Ltd, Vadodara • Pioneer Embroideries Ltd, Mumbai • Pyarelal Agro & Export Pvt Ltd, Mumbai • Vidhi Trading, Mumbai • VishwatriveniCotspin Pvt Ltd, Wardha

5.5 Contract Research Project:

5.5.1 Development of microbial inoculum for in situ degradation of agricultural waste (M/s. Relegare Agro-life bio science Pvt Ltd, Ahmednagar (MH))

The contract research project was taken in collaboration with M/s. Relegare Agro-life bio-science Pvt Ltd, Ahmednagar (MH) with an aim to develop bacteria based microbial inoculum for in situ degradation of agricultural waste, particularly sugarcane trash after harvesting.

During the previous year, Sugarcane trash biomass sample was analyzed for multielement composition using ICP-MS analysis. Furthermore, various important research activities including characterization of enzymatic activities of isolated bacteria, morphological characterization, gram nature activities, compatibility test, and molecular identification (Table) of the 6 most prominent cellulose, hemicellulose degrading and pectinolytic degrading bacteria (01) were conducted.

Table Molecular Identification of Polysaccharide-Degrading Bacterial Isolates Based on 16S rRNA Gene Sequencing

Functional group	Isolates	Gram nature	Shape	Nearest identified culture	Similarity (%)	Accession Numbers
Cellulose degrading bacteria	CDB-01	Gram Postitive	Rods	Bacillus inaquosorum	99.73%	NR_116188.1
	CDB-07	Gram Postitive	Rods	Paenibacillus favisporus	99.54%	NR_029071.1
Xylan degrading bacteria	XB-15	Gram Postitive	Rods	Bacillus tequilensis	99.76%	NR_117611.1
	XDB-16	Gram Postitive	Rods	Bacillus subtilis	99.86%	NR_102783.2
	XDB-18	Gram Postitive	Rods	Bacillus tequilensis	99.92%	NR_117611.1
Pectin degrading bacteria	PDB-03	Gram Negative	Rods	Enterobacter hormaechei subsp. xiangfangensis	99.58%	NR_126208

5.5.2 Development of Nanofibre and Bio-composite utilizing fish waste resources under circular economy.

It is an inter-institutional collaborative project with ICAR–National Bureau of Fish Genetic Resources (ICAR-NBFGR), Lucknow. Under the project, chitosan- and collagen-derived quantum dots synthesized from fish scales were utilized for the development of nanofibres using polyvinyl alcohol (PVA) as the polymer matrix. The developed nanofibres were characterized using BET surface area analysis, Fourier Transform Infrared Spectroscopy (FTIR),

Scanning Electron Microscopy (SEM), and Thermogravimetric Analysis (TGA) to evaluate their surface properties, chemical characteristics, morphology, and thermal behaviour. In addition, Shipi Micro Particles (SMP) produced from fish-scale-derived materials were received from ICAR-NBFGR, Lucknow. The SMP were explored as a filler material for natural fibre-reinforced composites, with the objective of enhancing their mechanical, thermal, and barrier properties. The incorporation of SMP as a functional filler has the potential to improve the structural stability and functional performance of natural fibre-reinforced composite materials.

Chapter 6

6. Awards & Recognitions

6.1 Awards

- Dr. Kirti Jalgaonkar, received Certificate of Excellence for 'Women in Science 2025' at the Celebrating Womanhood 2025 event, organized by Association of Food Scientists and Technologists (India), Mumbai Chapter in collaboration with the Institute of Chemical Technology (ICT), CASMB, Farm to Fork Solutions, National Young Academy of Sciences (INYAS), INSA, New Delhi on April 08, 2025, at Institute of Chemical Technology (ICT) Mumbai.
- Research work titled “Environmental sustainability by replacing non-biodegradable plastic coatings (like polyethylene) with biodegradable plant-based coatings” by team of Dr. A. Arputharaj, Dr. Pandiselvam and Mr. Mukesh, got second prize in the Research category of N.K. Proteins Innovation awards for cottonseed & cottonseed supply chain, presented during the 6th SEA-AICOSCA Cottonseed, Oil and Meal Conclave – 2025 at Vijayawada, held during August 02-03, 2025.
- Dr. Manoj Kumar Mahawar was conferred the 'Excellence in Research Award' at the International Conference on Advances in Agricultural Sciences, Environmental Stewardship, Biological & Life Sciences. Organised by the Society of Agricultural Research, Applied Technology and Environmental Science, India, during August 16–17, 2025.
- Dr. Manoj Kumar Mahawar received the Distinguished Service Award–2025 from the Indian Society of Agricultural Engineers for his significant contributions in Processing, Dairy and Food Engineering during November 10-12, 2025 at ICAR-CIAE, Bhopal,
- Dr. GTV Prabu was conferred the “Excellence in Research Award” in the field of Textile Technology at the International Conference-SIAVAS-2025, jointly organized by University of Agricultural Sciences (UAS), Raichur and NADCL, Baramulla, Jammu and Kashmir, during December 29–31, 2025.
- Dr. A. S. M. Raja, Head, Quality Evaluation and Improvement Division (QEID) and Chairman of the BIS Physical Methods of Test Sectional Committee (TXD-01), received the “Committee of the Year Award – 2025” on behalf of TXD-01 for its outstanding work in standardization by the Bureau of Indian Standards (BIS), New



Delhi. The award was presented by Hon'ble Minister of Consumer Affairs Shri B.L. Verma, on the occasion of World Standards Day 2025 at NITS, Noida on October 14, 2025.



- Dr. R. Pandiselvam won first prize (Oral presentation) for paper titled 'Transforming Cottonseed Oil into Eco-Conscious Hydrophobic Coatings: A Step towards Sustainable Packaging in a Circular Economy' (Co-Authors: Mukesh Onkar, A. Arputharaj, Sujata Saxena, Kirti Jalgaonkar), presented at the International Conference of Sustainable Food-Water-Energy-Mechanization-Nexus and Whole Grain (SWEMf Nexus 2025), during January 27-28, 2025 at AEC & RI, TNAU, Kumulur, Tamil Nadu.

In the 59th Annual Convention of ISAE and International Symposium on Mechatronics and Robotics in Pre and Post Production Agriculture, held during November 10-12, 2025 at ICAR-CIAE, Bhopal,

- Dr. Sheshrao Kautkar received the Best Oral Presentation Award for his paper, "Development and Evaluation of Deep-Groove Forming Machine for Indian

Ginneries," under the theme: Post Harvest Engineering and Technologies

- Dr. Shekh Mukhtar Mansuri received the Best Oral Presentation Award for the paper "Machine Vision System for Real-time Modelling and Grading of Arid Fruits," under the theme Processing, Dairy and Food Engineering,
- Paper titled, 'Development and Performance Evaluation of Electronic Planter Modules Retrofitted on Newly Developed Independent Floating Furrow Openers', presented by Gautam, P.V. and co-authored by Kushwaha, H.L. and Mansuri S. M., won first prize in Oral Presentation, under



subtheme Farm Machinery and Power.

- Dr. GTV Prabu received the Best Oral Paper Award for his research paper titled "Sustainable Nutrition through Electrospun

Nanofiber Delivery System in Tomato for Improved Nutrient Absorption” at the International Conference on Sustainable Innovations in Agriculture, Veterinary and Allied Sciences (SIAVAS-2025), held during December 29–31, 2025.

6.2 Recognition

Chair / Panellist

- Dr. R. Pandiselvam served as Jury for the theme of Food Value Addition, Storage and Post Harvest Technology during the SWEMf Nexus 2025, held during January 27-28, 2025, at AEC & RI, Kumulur, Trichy.
- Dr. S. K. Shukla Chaired the Panel Discussion on the topic, “Challenges in Mechanization in Cotton”. at the National Workshop on 'Cotton yield improvement through HDPS', organised by ICAR-CICR on March 07, 2025
- Dr. V. G. Arude was Panelist in the discussion and delivered a talk on “Challenges and strategies for successful mechanization of cotton harvesting in India” at the National Workshop on 'Cotton yield improvement through HDPS', organised by ICAR-CICR on March 07, 2025
- Dr A S M Raja Co-chaired a session on “Cotton Mechanization”, during the National Workshop on 'Cotton yield improvement through HDPS', organised by ICAR-CICR on March 07, 2025
- Dr. S. K. Shukla, Director, ICAR-CIRCOT participated as a Panellist for the session “Cotton 360 Degree: Building a Sustainable and Resilient Cotton Ecosystem”, at the 6th SEA AICOSCA Cottonseed, Oil and Meal Conclave 2025 held at Vijayawada during August 02-03, 2025.
- Dr. A. Arputharaj participated as a Panellist for a session “Diversification of cotton linters value addition: Current scenario and future prospects” at 6th SEA-AICOSCA Cottonseed, Oil and Meal Conclave 2025 held at Vijayawada during August 02-03, 2025.
- Dr. S. K. Shukla, Director, ICAR-CIRCOT participated as a Panellist in the session, “Evolving Trends in the Cotton Farming”, during the 4th Global Cotton Conference organized by CITI at New Delhi on the occasion of World Cotton Day, on October 07, 2025
- Dr. G. Krishna Prasad Chaired the “Technical Textiles” session during the 6th International Conference on Industrial Textiles – Products, Applications and Prospects (INDUTECH-2025), held on December 11–12, 2025, at PSG College of Technology, Coimbatore, India.
- Dr. A. S. M. Raja and Dr. G. T. V. Prabu served as technical experts during the panel discussion on “Value Creation and Market Competitiveness with Kasturi Cotton: Opportunities for Spinners and the Downstream Industry,” organized in collaboration with ICAR-CIRCOT, TEXPROCIL and SIMA as part of the Kasturi Cotton Bharat awareness cum-promotion programme on November 05, 2025, at SIMA, Coimbatore.
- Dr. K. Pandiyan served as the Chief Guest for the “Farmer Training for Special Project on Cotton Technology,” organized jointly by

CITI-CDRA, Mumbai and ICAR-CICR, Nagpur, at Daftari Ginning & Pressing, Seloo, Wardha, on November 05, 2025. He also delivered a lecture on Best Post-Harvest Management Practices for Cotton and Fibre Quality Parameters under the ICAR-CICR Special Project “Targeting Technology to Agro-Ecological Zones.”

6.2.1 Invited Lecture/Talks

- Dr. N. Vigneshwaran, delivered a lead talk (Online) on “Nanoformulations: Enhancing Efficacy and Ensuring Quality Control for Improved Crop Management” on February 20, 2025 during the International Conference - OHPGPR 2025 (International Conference on One health perspectives in Global Plant Protection Research) organized by Tamil Nadu Agricultural University Coimbatore.
- Dr. N. Vigneshwaran delivered an invited talk (online) on “Nanocellulose from lignocellulosic biomass: Synthesis, Characterization and Applications” as a Guest Speaker on February 28, 2025 during the National Training Program on “Recent advances in microbial conversion of lignocellulosic biomass into value-added products” organized by ICAR-NBAIM, Mau.
- Dr. A.K. Bharimalla presented on 'Women in agri-business: The driving force behind agricultural transformation and sustainability' as a keynote speaker, during the Global conference on “Innovations to impact: Gender transformative approach for sustainable agri-food system (IIGASA-2025), held during March 08-10, 2025 at ICAR CIWA, Bhubaneswar, Odisha.
- Dr. Jyoti Dhakane-Lad, delivered an invited lecture (in virtual mode) on “Role of ICAR CIRCOT ABI: In Fostering Agri-startups” on March 10, 2025 during the 21 days Summer School Program on “Developing Value Chain in Onion and Garlic: Prospects for Agri Startups” organized by ICAR-DOGR, Pune for potential entrepreneurs, startups, FPOs, farmers and students.
- Dr. N. Vigneshwaran delivered an invited lecture (online) on “Microbial electrolysis cell (MEC) for efficient production of hydrogen gas from biomass” on March 21, 2025, in the 10 days short course on “Advances in Hydrogen Production for Clean Energy and Environment” conducted by ICAR-CIAE, Bhopal.
- Dr. Himanshushekhkar Chaurasia, delivered an invited lecture on "Web App Development using Streamlit" in the CAFT



Training Program “Tools and Techniques for Artificial Intelligence based Web Application Development in Agriculture” on March 21, 2025 at ICAR-IASRI, New Delhi.

- Dr. S. K. Shukla, Director delivered an invited lecture on topic “Latest Technologies for Ginning of Cotton to Meet Kasturi Cotton Standards” on September 11, 2025, during Sectoral Seminar on 'Global Cotton, Local Strength-Positioning Maharashtra as a Leader in Cotton Innovation', organized by Indo Cotton Development Association (ICDA), under the ambit of SMART Project, Govt. of Maharashtra, at VANAMATI, Nagpur.
- Dr. S. K. Shukla, Director, delivered an invited talk on “Cotton Quality Standards” in the session Sustainable Farm to Fabric ecosystem: Multifaceted Innovations in Natural Fibre Cultivation, Processing and Value Chains, at the National Conclave on “Weaving India Together – Natural Fibres, Innovation & Livelihoods from the North East and Beyond, at NASC Complex on October 07, 2025.
- Dr. S. K. Shukla, Director, delivered an invited talk on “Mechanization of Cotton Harvesting in India: Challenges and Way Forward” during the 59 Annual Convention of ISAE and the International Symposium on Mechatronics and Robotics in Pre and Post Production Agriculture, at ICAR-CIAE, Bhopal, from November 10–12, 2025.
- Dr. G. Krishna Prasad delivered the keynote Address on “Sustainable Fibre Blends for Next-Gen Para-aramid Protective Gloves” during the One-Week International Seminar

on “Advancing Fashion Design Through Quantum Techniques” organized by the School of Design, Presidency University, Bengaluru on 16 November 2025 (online mode).

- Dr. A. S. M. Raja served as a resource person and presented a lead paper on “Sustainability of Cotton for Fashion and Textile Industries” during the 8-Day International Professional Development Programme on “Integrating Design, Technology, Management & Innovation in Fashion and Textiles” organized by Amity University Chhattisgarh on November 21, 2025

Members in Expert Committee

- Dr. V. G. Arude, Principal Scientist, has been nominated as a Member of the Institute Management Committee (IMC) of ICAR-CICR, Nagpur.
- Dr. Sujata Saxena, Head, CBPD chaired the 23rd meeting of the 'Speciality chemicals and dyestuffs' Sectional committee (TXD 07) of the BIS held in online mode on May 30, 2025.
- Dr. Sujata Saxena, Head, CBPD attended the 27th Textile Division Council meeting of the BIS held on June 11, 2025 in online mode.
- Dr. S. K. Shukla, Director, CIRCOT and Dr A.S.M. Raja, Head QEID attended Variety Identification Meeting of Cotton BT hybrids/varieties & Non Bt hybrids under AICRP on Cotton as Resource Person on June 19, 2025.
- Dr. N. Vigneshwaran participated as a DBT

nominee in the first IBSC (Institute Biosafety Committee) meeting of UPL Limited, Thane, on June 20, 2025 at the RD Shroff Research and Technology Development Centre, UPL Ltd., Thane.

- Dr. A. S. M. Raja, Head, QEID, served as an Expert member of the Research Evaluation Committee (REC) for the evaluation of project proposals received under Phase IV of the BIS R&D Project, pertaining to the Sectional Committee TXD 07 – Textiles, Specialty Chemicals and Dyestuffs, held on December 22, 2025.
- Dr. N. Shanmugam participated in the 25th Meeting of TXD 14 – Textile Machinery and Accessories Sectional Committee, organized by Bureau of Indian Standards (BIS), New Delhi, on December 05, 2025 through virtual mode.
- Dr. T. Senthilkumar, participated in the 13th Technical Committee Meeting of the Clothtech Sectional Committee, organized by BIS, New Delhi, on December 09, 2025 through virtual mode.
- Dr. N. Vigneshwaran, attended the 25th Meeting of BIS – TXD 35: Technical Textiles for Agrotech Sectional Committee as a committee member on December 17, 2025 through online mode.
- Dr. N. Vigneshwaran, attended the 2nd IBSC Meeting of UPL Limited, Thane, held on December 19, 2025 through online mode, as a DBT nominee.
- Dr. T. Senthilkumar, participated in the 33rd Technical Committee Meeting of Physical Methods of Test Sectional Committee (TXD

01), organized by BIS, New Delhi, on December 22, 2025 through virtual mode

Participation in Meetings/Discussions/Events by Director Dr. S. K. Shukla

1. Attended 87th Foundation Day celebration of ICAR-NINEFT and participated in National Natural Fibre Festival (NNFF) 2025, during January 02-04, 2025.
2. Attended Research Advisory Committee (RAC) Meeting of ICAR-CICR, Nagpur, during January 17-18, 2025
3. Visited CIAE, Bhopal on February 14, 2025, for assessing the field trials of cotton stripper harvester developed by CIAE, Bhopal in collaboration with ICAR-CIRCOT and ICAR-CICR and also participated in Silver Jubilee function of ICAR-CIAE, Bhopal on February 15, 2025.
4. Participated in the National Workshop on Cotton Yield Improvement through HDPS organised by ICAR-CICR, Nagpur, on March 07, 2025 at Nagpur.
5. Attended the Second Meeting of Stakeholders under the aegis of Committee on Cotton Production and Consumption (COCPC) on March 24, 2025, organized by the Office of the Textile Commissioner, Ministry of Textiles, GOI, through video conferencing.
6. On April 04, 2025, participated in Seminar on Quality and Marketing of Australian Cotton where presentation on Quality and Marketing aspects of Australian Cotton was given by Australian Cotton Shippers Association members, event organized by CAI, at Mumbai.

7. Visit to Nagpur during May 17-19, 2025 during visit of Hon'ble Union Agriculture Minister for launch of Viksit Krishi Sankalp Abhiyan and also showcased Technologies developed by ICAR-CIRCOT, during the exhibition at the Suresh Bhat Auditorium at NBSS & LUP, Nagpur on May 18, 2025.
8. Participated in the Annual Vice-Chancellor's and ICAR Director's conference at ICAR HQ, New Delhi on May 20, 2025.
9. Attended four online meetings, on May 12, 2025, organized by HAM office, on May 15, 2025, organized by NIASM, Baramati, on May 18, 2025, a farmer meeting at Nagpur and on May 24, 2025, conducted by Hon'ble Union Agricultural Minister under Viksit Krishi Sankalp Abhiyan programme.
10. Participated in Nagar Rajbasha Karyanvayan Committee (NARAKAS) meeting for propagation of Hindi, conducted at Western Railway Headquarters on May 23, 2025.
11. Participated in Textile Advisory group meeting chaired by Hon'ble Union Minister in New Delhi on May 27, 2025.
12. Attended the 53 'Joint Agricultural Research and Development Committee Meeting - 2025' (AGRESCO) of the four agricultural universities of Maharashtra held at Vasantao Naik Marathwada Agricultural University, Parbhani from May 29 to 31, 2025. This event also marked the launch of the Viksit Krishi Sankalp Abhiyan (VKSA) in Maharashtra state.
13. Conducted an online meeting with the Chief General Manager (Marketing) of CCI, Navi Mumbai on June 17, 2025, regarding organizing skill development programmes, in registered G & P factories under the Kasturi Cotton Bharat programme.
14. On June 20, 2025, was called upon for a meeting with Hon'ble Union Agriculture Minister Shri Shivraj Singh Chauhan during his visit to Mumbai, where the activities of ICAR-CIRCOT, Mumbai was reviewed by the Hon'ble Agriculture Minister.
15. On June 24, 2025 participated in an online meeting conducted by the Hon'ble Union Minister for Agriculture and Farmers' Welfare to review the Viksit Krishi Sankalp Abhiyan programme.
16. On June 25, 2025 had a meeting with officials of Fast Retailing Company Ltd., regarding successful implementation of mechanization of cotton harvesting in India.
17. Visited GTC, Nagpur on July 08-09, 2025 and had a discussion with local gineries regarding taking of contract research work on GOT measurements for CCI Ltd.
18. Participated in a meeting with SMD at New Delhi on July 17, 2025, regarding Technology Mission on Cotton proposal.
19. Participated in a meeting with NITI Aayog on July 17, 2025 at New Delhi for presentation of EFC document of TMC Phase II project.
20. Participated in the 6th SEA-AICOSCA Cottonseed, Oil & Meal Conclave - 2025 at Vijayawada and delivered talk on "Improving Production, Post-harvest and Ginning Practices to Compete with the Global Market" during Aug 02-03, 2025.

21. Attended meeting of coordination team on August 28, 2025, for preparing action plan for the VKSA phase I (Kharif Crop 2025).
22. Participated as expert at National Conclave on "Weaving India Together – Natural Fibres, Innovation & Livelihoods from the North East and Beyond, at NASC Complex on October 07, 2025.
23. Participated as panelist at the Fourth Global Cotton Conference on October 07 2025 organized by CITI at New Delhi on the occasion of World Cotton Day.
24. Participation in RAC meeting of ICAR-CICR, Nagpur as a member on December 01, 2025.
25. Visit to Kisan Agri Expo 2025 at Pune & visit to review activities of ICAR-CIRCOT supported Agripreneurs based in Pune, during December 13-14, 2025.
26. Attended a meeting titled, "Redefining the Agricultural Research Ecosystem in Maharashtra - From Output to Impact", which was an interactive meeting of Secretary DARE & DG, ICAR with officials from Govt. of Maharashtra on December 17, 2025.

Chapter 7

7. Publications

7.1 Research Papers

1. Ashutosh Pandey, A. Arputharaj, N. Vigneshwaran, A.S.M. Raja, T. Senthil Kumar, Sharmila Patil, P. Suresh Kumar, D. Raja, R. Pandiselvam. (2025). *Advancement in biodegradable foam for Packaging, Filtration, Thermal insulation and Medical Application: A Review. Waste and Biomass Valorization*. (NAAS: 8.6).
2. Basak, S., D. B. Shakyawar, D. P. Ray, L. Ammayappan, Manisha Jagadale, Naveen Jose, A. S. M. Raja, S. Sinha, and R. Dhantole. "Cotton-jute fibre reinforced natural rubber and cactus leaf gel based flame resistant composite for automobiles." *Cellulose* (2025): 1-29. <https://doi.org/10.1007/s10570-025-06784-5> (IF: 4.8, NAAS: 10.8)
3. Bharimalla, A.K., Patil, S., Dhakane-Lad, J. Mahawar, M.K., Nadanathangam Vigneshwaran, Kautkar, S. (2025). *Blending of cellulose nanofibers with cotton linter pulp to enhance the mechanical and barrier properties of paper. Scientific Reports* 15, 11788. <https://doi.org/10.1038/s41598-025-96213-1>. (NAAS: 9.8).
4. Chaurasia, H., Arora, A., Marwaha, S., Jain, R., Chinnusamy, V., Raju, D., Ray, M., and Sahoo, R.N. (2025). *Artificial Intelligence Based Web tool for Classification of Rice Panicle Stages. Journal of Community Mobilization and Sustainable Development*, 20(1), 291-295.
5. Dukare, A., Sharma, K., Nehete, L., Dsouza, C, Vigneshwaran N, and Saxena S. (2025). *Optimization of xylanase production by Bacillus sp. in submerged fermentation using cotton biomass as cost-effective feedstock and its potential application for bio-bleaching of cotton stalk pulp. Biomass Conv. Bioref.* <https://doi.org/10.1007/s13399-025-06522-8>. (NAAS: 9.5)
6. Esra Nur Gul, Emine Polat, Ebubekir Altuntas, Manoj Kumar Mahawar. (2025, November) *Engineering and germination characteristics of okra (Abelmoschus esculentus L.) cultivars: Implications for processing and cultivar selection. Journal of the Saudi Society of Agricultural Sciences* (2025) 24:61 <https://doi.org/10.1007/s44447-025-00062-3>
7. J.B. Potkule, S.P. Kahar, M. Kumar, U.S. Annapure, *Assessing the impact of pin-to-plate atmospheric cold plasma on activity, stability, kinetics, and conformation of α -amylase, Int. J. Biol. Macromol.* 285 (2025) 138282. <https://doi.org/10.1016/J.IJBIOMAC.2024.138282>. (NAAS rating: 14.5)
8. Jalgaonkar K, Jagajanantha P, Mahawar MK, Dhakane-Lad J, Patil S, Kautkar S. (2025). *Development of Activated Charcoal-Treated Polyester Cotton Blend Fabric for improving Pollutant Removal Efficiency. Agriculture Association of Textile Chemical and Critical Reviews*, Accepted (NAAS Rating: 6.00)
9. Jalgaonkar K, Krishna Prasad G, Mahawar MK, Senthilkumar T, Dukare A, Jha NK, Dhakane-Lad J, Patil S, Jagajanantha P, Kautkar S. (2025). *Application of Natural Plant Fibres in Development of Sustainable Concrete: A Review. Journal of Scientific and Industrial Research*, Accepted (NAAS:6.70)

10. Jungare, S. P., Joshi, P. V., Sharma, M. K., & Kumar, M. (2025). *Moisture Management Technologies in Cotton Ginning Industry: Enhancing Quality and Efficiency. Sensors and Materials*, 37(11), 5247-5268. (NAAS: 7)
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- 7.2 Technical/popular Article: (13)**
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 2. Chaurasia, H., Shanmugam, N., Sharma, K., Arora, A., & Murmu, S. (2025). AI revolution in cotton processing. *Krishi Science*, ISSN: 2583-4150. <https://krishiscience.co.in>. [E-publication]
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 6. मनोज कुमार महावर, शेषराव काऊतकर, रोहित घोसरे, ज्योती ढाकने-लाड, अशोक कुमार भारीमल्ला, डी.एम. कदम (2025). कपास की गुणवत्ता के लिए बेलिंग तकनीक: आवश्यकता एवं संभावनाएं. अंबर (12): 18-21
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 10. Chaurasia, H. and Chandrasekaran, S. (2025). Trends in the Growth and Development in the Cotton Sector. *Agricultural Engineering Today* (English volume), 49(2), 59-60.

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13. डॉ. कनिका शर्मा, डॉ. मनोज कुमार, डॉ. अजिनाथ डुकरे, डॉ. सुजाता सक्सेना | कपास के पौधों में पाए जाने वाले गॉसिपोल का औषधीय महत्व और संभावनाएं | अंबर, अंक 10, 2023

7.3 Books: (05)

- *Achievements & Progress of Projects under Consortium Research Platform on Natural fibres (CRP- NF) during the period from 2015-2025*, 2025. Eds. Shakyawar D B, Shukla S K, Raja, A S M, Debnath S, Ammayappan L, Basak S, Samanta K K, published by ICAR- NINFET, Kolkata, 70p.
- Mayee, CD., Shukla S.K., and Kumar M. (2025). *Cotton in Indian Circular Economy: A Journey from Farm to Fashion*. Astral Publications.
- *Advancements in Arid Agriculture for the 21st Century: Emerging Paradigms, Innovations, and Future Prospects*. 2025. Published by IIP Iterative International Publishers, Editors: Dr. Anandkumar Naorem, Dr. Shekh Mukhtar Mansuri. ISBN: 978-93-7020-368-6. pp: 1-210.
- *CIRCOT Annual Report 2024*
- *Technological Report -AICRP on Cotton*

7.4 Book Chapter (07)

- Arora, A., Deb, C.K., Misra, T., Chaurasia, H., Marwaha, S., Parsad, R. (2025). *Advancing Toward Sustainable Agriculture Through Artificial*

Intelligence: Case Studies in Indian Agriculture. In: Pathak, H., Lakra, W.S., Gopalakrishnan, A., and Bansal, K.C. (eds) *Advances in Agri-Food Systems*. Springer, Singapore, pp. 273-286, ISBN: 978-981-96-0758-7.

- Dukare, A., Shaikh, A., Pawar, A., Sharma, K., Vigneshwaran, N. (2025). Valorization of Cotton Biomass and Processing Waste for Production of Biohydrogen and Biomethane. In: Mukherjee, G., Dhiman, S. (eds) *Value Addition and Utilization of Lignocellulosic Biomass*. Springer, Singapore. https://doi.org/10.1007/978-981-96-2786-8_5.
- Sharmila Patil, V. G. Arude, P. Jagjanantha, ASM Raja, Sujata Saxena, S. K. Shukla and N. Shanmugam. (2025). Post-harvest Processing of Cotton. In: *Handbook of Agricultural Engineering (Revised Second Edition)*. Published by Directorate of Knowledge Management in Agriculture, Indian Council of Agricultural Research, New Delhi.
- Sarkar, A., Ghosh, S., Sinha, D., Das, P., Murmu, S. and Chaurasia, H. (2025). Harnessing CRISPR Technology to Edit Noncoding RNAs for Enhanced Disease Resistance in Crops. In: Chen, J. (Eds.) *Genome and Epigenome Editing for Stress-Tolerant Crops*. Wiley. ISBN: 9781394280018
- G Krishna Prasad, T. Senthilkumar, GTV Prabu and L Ammayappan (2025). Review on Mechanical Processing of Wool Fiber for Development of Diversified Products. *Indian Journal of Natural Fibre*, Vol. 11, No.1. pp. 79-88, ISBN: 2348-7445.
- Vigneshwaran, N., Arputharaj, A. (2025). Enhancing the Functionality of Natural Fiber Textiles Through in

Situ Nanofinishing Techniques: A Sustainable and Cost-Effective Approach. In: Muthu, S.S. (eds) Sustainable Nano Textile Technology. Textile Science and Clothing Technology. Springer, Cham. https://doi.org/10.1007/978-3-032-05902-4_2.

- Dagar, P., Arora, A., Kumar, S., Marwaha, S., Jain, R., Chaurasia, H., and Chinnusamy, V. (2025). Processing 3D Point Clouds for High-Throughput Plant Phenotyping. In: Chaudhury, S., Mishra, A., Namboodiri, A.M., Jayagopi, D.B., Sinha, N., Nagar, R. (eds) Computer Vision, Pattern Recognition, Image Processing, and Graphics. NCVPRIPG 2023. Lecture Notes in Electrical Engineering, vol 1218. Springer, Singapore, pp. 61-67, ISBN: 978-981-97-5211-9.

7.5 Other Publications: Leaflet/Brochure/ Training Manual etc.) [35]

7.5.1 Training Manual (4)

- Training Manual titled, “Spectroscopic and Chromatographic Techniques for Material Characterization”
- Training Manual titled, “Smart Textiles and 3D Printing” published (ISBN: 978-81-984563-6-6)
- Training Manual on “Pulp and Paper Technology”
- Laboratory Manual on “Basic Molecular Biology and Genome Editing techniques” (ISBN number: 978-81-987215-9-4)

7.5.2 Leaflets/Brochure (19)

- Industrial Multilayer Woven cut-resistance gloves (ICAR CIRCOT/ TECH / 2025 /07 /Leaflet)

- ICAR-CIRCOT Seed Cotton Storage Bag with Anti-Microbial Finish (ICAR-CIRCOT/TECH/2025/09/Leaflet)
- Brochure titled, *Harvesting Innovation: Startup Success Stories at CIRCOT R-ABI* (ICAR-CIRCOT/MISC/2025/10/Brochure)
- Sustainable Textiles from Novel Blends of Cotton / Hemp (ICAR-CIRCOT/TECH/2025/11/Leaflet)
- ICAR-CIRCOT Nanosulphur Production Technology (ICAR-CIRCOT/TECH/2025/13/Leaflet)
- Under the Viksit Kisan Sankalp Abhiyaan (VKSA), four leaflets in Marathi language published as given below,
- Swachh Kapus Vechnisathi Sarvottam Sheti Padhati [Best Farming Practices for Clean Cotton Picking (**English translation**)]
- Kaapus Pikaachya Avashesh Vyavasthapanasaathi Sarvottam Sheti Padhati [Best Farming Practices for Cotton Crop Residue Management (**English translation**)]
- Kapus Vahatuk Aani Saathavnuksaathi Sarvottam Sheti Padhati [Best Farming Practices for Cotton Transportation and Storage (**English translation**)]
- Kaapsaacha Utpannaat Vaadh: Yogya Biyaanyanchi Nivad Va Tantu Gunavatteche Mhahatva [Increasing Cotton Yield: Importance of Right Seed Selection and Fiber Quality (**English translation**)]
- Leaflet on “Cotton Stalks logistics”
- कापूसपिकाच्या अवशेषव्यवस्थापनासाठी सर्वोत्तम शेती पद्धती (In Marathi)
- बायोचार आणि मशरूमच्या उत्पादना द्वारे कापसाच्या पन्हाटीचे मूल्यवर्धन (In Marathi)

- Leaflet (VKSA) titled “Accelerated process for preparing bio-enriched compost from cotton plant residues”.
- Training Leaflet titled, “Basic Molecular Biology and Genome Editing Techniques”.
- Training Leaflet on, “Advances in Applications of Nanotechnology”.
- Training Leaflet on, “Pulp and Paper Technology”.
- A Leaflet entitled “Microbiological Testing and Consultancy Services for Cotton Textiles”.
- Training Leaflet titled, “Electrospinning for Nano fibre Production”.
- Training Leaflet titled, “Fibre Reinforced Composite Materials and its Applications”.

7.5.3 Booklet (08)

- Janjatiya Gaurav Varsh Pakhwada 2025, Activity Report Pg. 1-42.
- ICAR-CIRCOT: A Glimpse (February 2025). Pg. 1-54
- ICAR-CIRCOT: A Glimpse (December 2025) Pg. 1-51
- AMBAR 2024
- Best Management Practices for Producing Quality Cotton Fibre
- Post-Harvest Handling, Quality Evaluation & Value Addition to Cotton and its By-produce
- Kapus aani tyachchya up-utpadananche kadhani nantarche vyavasthapan, gunvatta mulyankan aani mulyavardhan (In Marathi)
- Kapaas aur uske up-utpaadh ka kataayi upraant prabhandan, gunvatta mulyankan tatha mulya Vardhan (In Hindi)

7.5.4 E-Publications: (4)

- Jagajanantha P. (2025). Overview of advance equipment's in assessing lint quality of cotton. Agriculture & Food: E-Newsletter 7(3): 69-71.
- CIRCOT-R-ABI newsletter “Udaan” (July-Dec 2024) (ICAR-CIRCOT/MISC/2025/12/Newsletter)
- UDAAN- CIRCOT R-ABI e-Newsletter, July-Dec: Pg.1-42
- CIRCOT eNews: Monthly eNewsletter 12 issues Jan – Dec, 2025.

7.6 PAPERS PRESENTED in Seminars & conferences: (19)

1. A S M Raja presented “Salient achievements and progress of CRP on Natural fibre Projects”, during the National workshop on Leveraging Natural Fibre based Sustainable Textiles & Value-Added Products, organized by ICAR-NINFET, Kolkata on January 02, 2025.
2. Paper titled “Transforming Cottonseed Oil into Eco-Conscious Hydrophobic Coatings: A Step towards Sustainable Packaging in a Circular Economy”, presented by Dr. R. Pandiselvam at the International Conference of Sustainable Food-Water-Energy-Mechanization-Nexus and Whole Grain (SWEMf Nexus 2025), during January 27-28, 2025 at the Agricultural Engineering College and Research Institute (AEC & RI), TNAU, Kumulur, Tiruchirapalli (Trichy Dist.), Tamil Nadu, jointly organised by the AEC & RI, Trichy, NIFTM, Thanjavur and University of Guelph, Canada.

At the National Conference on Eco- Friendly and Sustainable Concepts in Fashion and Textiles organized by Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu in hybrid mode on March 15, 2025, following two papers were presented,

3. Dr. G. Krishna Prasad, presented a paper on *"Sustainable flame-resistant gloves: Blending recycled para-aramid fibres with cotton for improved performance."*
4. Dr. T. Senthilkumar, presented a paper on *"Study on low-stress mechanical properties of cotton/hemp sustainable textiles."*
5. Dr. A. S. M. Raja presented the salient points regarding progress of the fibre quality research component under the AICRP on Cotton at ICAR-CIRCOT, during the Annual Group Meeting of AICRP on Cotton on March 21-22, 2025 at Guntur.
6. Paper titled *"Potential Technologies for Improvement of Indian Ginning Industry"*, was presented by Dr. S. K. Shukla, Director, ICAR-CIRCOT during the National Seminar on Potential for Improvement of Indian Ginning Sector, organized by ISAE Mumbai Chapter in collaboration with ICAR-CIRCOT on May 26, 2025 at Mumbai.
7. Dr. Kirti Jalgaonkar participated & presented a paper titled, *"Development of filter quality testing systems for air purification techniques"* during the 1st International Conference on Advances in Agricultural Sciences, Environmental Stewardship, Biological and Life Sciences (ICAASESBLS-2025), organised by the Society of Agricultural Research, Applied Technology and Environmental Science, India, (in Virtual Mode) on August 16-17, 2025.
8. Nandan Kumar, Shubham Srivastava, Chandra Shekhar Malvi, G. Krishna Prasad, presented paper titled *"Indian Origin Brown Cotton and UHMwPE Based Protective Textiles"* at 38th National Convention of Textile Engineers National

Seminar on Emerging Challenges of Sustainable Technical Textiles", organized by The Institute of Engineers (India), Ghaziabad centre on September 05-06, 2025.

At the 59th Annual Convention of ISAE and International Symposium on Mechatronics and Robotics in Pre and Post Production Agriculture, held during November 10-12, 2025 at ICAR- CIAE, Bhopal, the following six papers were presented,

9. Dr. V. G. Arude, presented research paper entitled *'High Production Double Roller Ginto Enhance Cotton Ginning Efficiency'*.
10. Dr. Sheshrao Kautkar, S. K. Shukla, V. G. Arude and D. U. Patil, presented paper on *"Development and Evaluation of Deep-Groove Forming Machine for Indian Ginneries"*.
11. Mansuri, S.M., Gautam, P.V. and Kushwaha, H.L. presented research paper entitled *'Machine Vision System for Real-time Modelling and Grading of Arid fruits'*, under theme, (Processing, Dairy and Food Engineering).
12. Gautam, P.V, Kushwaha, H.L. and Mansuri, S.M. presented paper titled, *'Development and Performance Evaluation of Electronic Planter Modules Retrofitted on Newly Developed Independent Floating Furrow Openers'*, under subtheme Farm Machinery and Power.
13. Mahawar MK, Kautkar S, Sundaramoorthy C, Dhakane-Lad J, Arude VG (2025), presented paper titled, *"Quantification of Processing Losses in Indian Cotton Ginning Industries"*.
14. Varsha Satankar, S.K. Shukla, S.V. Ghadge, K. Pandiyan, V.G. Arude and Kirti Jalgaonkar, presented a paper (in online

mode) entitled “Optimization of Lint Cleaners for Maximum Cleaning Efficiency”.

15. Dr. K. Pandiyan presented paper entitled “Biocontrol potential of *Streptomyces herbinensis* against major phytopathogens in cotton” in National Conference on Transforming Plant Health Management: Integrating Tradition Practices with Modern Innovations for Global Food Security”, organized by Indian Psychopathological Society, PAJANCOA & RI, Karaikal, Puducherry during December 18-19, 2025.

Following three papers were presented during 6th International Conference on Industrial Textiles (INDUTECH 2025) held during December 11-12, 2025,

16. “Heat-Generating Conductive Yarns and their

Applications in Smart Textiles”, by P. Jagajanantha.

17. “Effect of Cotton Stalk Micro-Particles on the Mechanical Properties of Hybrid Epoxy Composites”, by Dr. T. Senthilkumar
18. “Sustainable development of para-aramid and naturally colored cotton blend gloves with enhanced protective performance”, Dr. G. Krishna Prasad.
19. Research paper entitled “Sustainable Nutrition through Electrospun Nanofiber Delivery System in Tomato for Improved Nutrient Absorption”, was presented (virtual mode) by Dr. GTV Prabu at the International Conference on Sustainable Innovations in Agriculture, Veterinary and Allied Sciences (SIAVAS-2025), during December 29–31, 2025.

Chapter 8

8. IRC, RAC & IMC Meeting

8.1 XXXI Research Advisory Committee

The 31st Meeting of the Research Advisory Committee (RAC) of ICAR-CIRCOT, Mumbai was held in Hybrid mode during April 16-17, 2025. Dr. S. M. Ilyas, Former Vice Chancellor, Narendra Dev University of Agriculture & Technology, Faizabad & Former Director, ICAR-NAARM, Hyderabad and Chairman, RAC presided over the Meeting. Following Members Dr. Pitam Chandra, Former Director, ICAR-CIAE, Bhopal, Dr. S. P. Borkar, Prof., VJTI, Mumbai, Dr. K. Narsaiah, ADG (PE), Agril. Engg. Division, ICAR, New Delhi, Shri. M. M. Korde, Member, IMC (Representing Agriculture/Rural Interest), Dr. S. K. Shukla, Director, ICAR-CIRCOT, Mumbai, Dr. V. G. Arude, Principal Scientist, ICAR-CIRCOT, Mumbai, Member Secretary attended the meeting in person. Dr. R. V. Adivarkar, Professor, Department of Fibers and Textile Processing Technology, ICT, Mumbai and Shri. Sachin Kulkarni, Member, IMC (Representing Agriculture/Rural Interest) attended the meeting in virtual mode. All Head of Divisions and scientists of the Institute at HQ attended the meeting physically while the scientists at GTC of ICAR-CIRCOT, Nagpur attended it virtually.



The Committee thoroughly discussed and deliberated on the ongoing research and

development activities at the Institute. It provided valuable inputs and strategic directions to strengthen and realign future initiatives.



On the occasion of 31st RAC, a lecture was organized on 17th April 2025 on the topic entitled 'Recent Trends in Green Composites'. Lecture was delivered by Dr. S. P. Borkar, RAC Member & Professor, Textile Manufacturers Department, VJTI, Mumbai.



On the occasion five publications (4 leaflets and one booklet) were formally released by the Chairman and Members of the Research Advisory Committee (RAC).

8.2 Institute Research Council (IRC)

Annual Institute Research Council (IRC) meeting

The 125th Annual IRC meeting was held during May 01-02, 2025 in the Conference Room of ICAR-CIRCOT, Mumbai in Hybrid mode. Dr. S.K. Shukla, Director, ICAR-CIRCOT and the Chairman of the IRC conducted the

proceedings of the meeting. All the HoD's, Scientist and Technical Officers (ACTO and above) were present in the meeting.

As per the agenda, the new project proposals were taken up first, followed by presentation of the progress of the research by the concerned PI in respect of the completed and on-going projects core area-wise. During the annual IRC meeting 6 new projects were approved and final report of seven completed were presented and accepted. The annual progress of the on-going projects were also monitored.



*Mid-Term Institute Research Council
(IRC) meeting*

The Mid-Term Institute Research Committee (IRC) meeting was held under the chairmanship of Dr. S.K. Shukla, Director, ICAR-CIRCOT, Mumbai during January 21-23, 2025. The meeting was attended by all Heads of Division, Scientist and Technical Officers (ACTO and above). The progress of all the on-going institute projects, externally funded projects were presented by the principal investigator of the projects core-area wise. Chairman IRC insisted that the scientists should get more externally funded projects and also identify the stakeholders for the technologies and explore avenues for marketing of their technologies.



Chapter 9

9. Seminars / Conferences / Workshops

9.1 Seminar/ Conference /Workshop organized:

- **National Seminar on Ginning:** A National seminar on “Potential for Improvement of Indian Ginning Sector”(in hybrid mode) was organized by ISAE Mumbai Chapter in collaboration with ICAR-CIRCOT on May 26, 2025 in VC Hall, ICAR-CIRCOT, Mumbai. Stakeholders from the Textile Industry, Cotton Associations, Textile Committee, CCI and scientists/technical officers of the institute participated in the event. In total about 100 delegates participants attended the seminar.

The event was graced by the presence of Shri P.K Agrawal, Vice Chairman, Trident Group, Shri Vinit Mohota, Director, Gimatex industries, representatives from the Indian Council of Agricultural Research, Textile Committee, Cotton Corporation of India, Ginning and Spinning Industries, Cotton Association of India, TCS Digital Farming Initiatives, TEXPROCIL and other dignitaries working in the area of cotton processing including ginners from Maharashtra, Telangana, Gujarat, and Karnataka. The technical session was chaired by Dr. S.N. Jha (DDG, Agril Eng.

and President ISAE) and Dr. K. Narsaiah, ADG (PE), ICAR, and Dr. G. R. Anap, Chairman, ISAE Mumbai Chapter

- **Awareness Seminar on “Standardization in the Field of Physical Testing of Cotton”**organised by ICAR–CIRCOT, Mumbai, in collaboration with the Bureau of Indian Standards (BIS), New Delhi on August 20, 2025, at ICAR–CIRCOT, Mumbai. (Total 42 participants attended the seminar)
- **Brainstorming session on “Value Addition to Banana Fibre for Improving the Livelihoodof Stakeholders”**was organized in collaboration with the Indian Fibre Society, Mumbai, on September 29, 2025 at Burhanpur, Madhya Pradesh. (Total 50 participants attended session)
- **Brainstorming session on “Traceability, Transparency and Sustainability in the Cotton Value Chain”** was organized in hybrid mode on the occasion of 102nd Foundation day of ICAR-CIRCOT and Agricultural Education Day on December 3, 2025. About seventy participants including cotton value chain experts, industry representatives, entrepreneurs, farmers, and other stakeholders attended the event.



- **Awareness Workshop on Kasturi Cotton Bharat** was organized by ICAR-CIRCOT in association with Karnataka Cotton Association, and TEXPROCIL on the theme “Sustainability of Indian Cotton with Special Reference to Kasturi Cotton”, at Hubballi, Karnataka on December 20, 2025. Sixty-three participants, including four females, attended the programme comprising of 30 farmers, 20 ginners, 13 officials from UAS Dharwad/CCI, Hubli/Seed companies. Dr S K Shukla, Director, CIRCOT delivered a Keynote address on Kasturi Cotton Bharat Programme and Dr. A S M Raja, Head, QEID, made a presentation on the topic, “Kasturi Cotton Testing, Standards and Compliance” during the workshop.
- **An Awareness Seminar (in hybrid mode) on “Standardization in the Field of Physical Testing of Cotton”** was organized by ICAR–CIRCOT, Mumbai in association with The Bureau of Indian Standards (BIS), New Delhi on August 20, 2025 at ICAR-CIRCOT, Mumbai premises. Forty-two participants, including eight women attended the seminar.
- **A lecture on “Trading of cotton at NCDEX for the benefit of farmers”** was organized by ICAR-CIRCOT on September 10, 2025. The lecture was delivered by Sh. Ajay Sharma, Asst. Vice President, NCDEX.
- **Lecture on the topic “Challenges & Way Forward on Industry-Oriented Research”** was organised by ICAR-CIRCOT on July 28, 2025. Dr Prashant Shukla, Professor, Dept. of Mechanical Engineering, IIT-BHU, Varanasi, delivered an insightful lecture.
- **Annual Review Workshop of CRP on Natural Fibres** was organized on March 18, 2025 through online mode to discuss about the progress of various sub projects under the chairmanship of DDG (Agri. Engineering).

9.2 Participation in Conferences/Seminar/Workshop:

A. International (8)

Sr. No.	Title	Date & Venue	Organised by	Participating Scientist
1.	International Conference of “Sustainable Food-Water-Energy-Mechanization-Nexus and Whole Grain” (SWEMF Nexus 2025)	January 27-28, 2025 Tamil Nadu	AEC & RI, Trichy, NIFTM, Thanjavur and University of Guelph, Canada.	Dr. R. Pandiselvam
2.	Global Conference on “Innovations to impact: Gender transformative approach for sustainable agri-food system” (IIGASA -2025)	March 08-10, 2025 Odisha	RAGA & ICAR-CIWA, Bhubaneswar	Dr. A.K. Bharimalla
3.	12 th ATEXCON Asian Textile Conference (IIGASA -2025)	March 25, 2025 Mumbai	Confederation of Indian Textile Industry (CITI), New Delhi	Dr. N. Shanmugam Dr. A. Arputharaj

Sr. No.	Title	Date & Venue	Organised by	Participating Scientist
4.	International Conference on “Advances in Agricultural Sciences, Environmental Stewardship, Biological & Life Sciences” (ICAASESBLs-2025)	August 16-17, 2025 Virtual Mode	Society of Agricultural Research, Applied Technology and Environmental Science, India	Dr. Kirti Jalgaonkar Dr. Manoj Kumar Mahawar
5.	Fourth Global Cotton Conference	October 07, 2025 New Delhi	CITI, New Delhi	Dr. S.K. Shukla Dr. A.S.M. Raja
6.	59 th Annual Convention of Indian Society of Agricultural Engineers & International Symposium on “Mechatronics and Robotics in Pre and Post Production Agriculture”	November 10-12, 2025 Bhopal	Indian Society of Agricultural Engineers, New Delhi & ICAR-CIAE, Bhopal	Dr. S.K. Shukla Dr. A.K. Bharimalla Dr. V.G. Arude Dr. Varsha Satankar (online) Dr. Manoj Kumar Mahawar Dr. Sheshrao Kautkar Dr. Shekh Mukhtar Mansuri
7.	The 6 th International Conference on “Industrial Textiles – Products, Applications and Prospects”. (INDUTECH 2025)	December 11-12, 2025 Coimbatore	PSG College of Technology, Coimbatore, Institute for Frontier Materials (IFM) Deakin University, Australia & Northwest Composites Centre Department of Materials, University of Manchester, UK	Dr. G. Krishna Prasad Dr. T. Senthil Kumar Dr. P. Jagajanantha
8.	International Conference on “Sustainable Innovations in Agriculture, Veterinary and Allied Sciences” (SIAVAS-2025)	December 29-31, 2025 Virtual Mode	UAS, Raichur, Karnataka & National Agriculture Development Cooperative Ltd. (NADCL) Baramulla, UT of J & K	Dr. GTV Prabu

B. National (18)

Sr. No.	Title	Date & Venue	Organised by	Participating Scientist
1.	National workshop on “Leveraging Natural Fibre based Sustainable Textiles & Value-Added Products”	January 02, 2025 Kolkata	ICAR-NINFET, Kolkata	Dr. A.S.M. Raja
2.	Seminar on “Technical Textile – Life Cycle Assessment Summit, 2025”	January 09-10, 2025 Mumbai	SASMIRA, Mumbai	Dr. G. Krishna Prasad Dr. T. Senthil Kumar
3.	Workshop on “Application of Advanced Analytical Techniques in Research & Industry”	February 18-19, 2025 IIT, Mumbai	Centre for Research in Nanotechnology & Science, IIT Bombay & Indian National Academy of Engineering	Ms. Pranali Dahihande
4.	National Level Workshop on “Jute - Production, Marketing & Utilization Strategies”	February 27, 2025 Kolkata	Directorate of Jute Development, MOA&FW, GoI& ICAR NINFET, Kolkata	Dr. N. Shanmugam
5.	National Workshop on “Cotton Yield Improvement through HDPS”	March 07, 2025 Nagpur	ICAR-CICR, Nagpur	Dr. S.K. Shukla Dr. A. S. M. Raja Dr. V. G. Arude
6.	National Conference on “Eco- Friendly and Sustainable Concepts in Fashion and Textiles”	March 15, 2025 Hybrid Mode	Bannari Amman Institute of Technology, Sathyamangalam Tami Nadu	Dr. G. Krishnaprasad Dr. T. Senthil Kumar
7.	Annual Group Meeting of ICAR-AICRP on Cotton - 2025	March 21-23, 2025 Guntur	ANGRAU, Guntur & ICAR-CICR, Nagpur	Dr. S.K. Shukla Dr. A.S.M. Raja Dr. A. Arputharaj Dr. T. Senthilkumar Dr. P. Jagajanantha

Sr. No.	Title	Date & Venue	Organised by	Participating Scientist
8.	Seminar on “Quality and Marketing of Australian Cotton”	April 04, 2025 Mumbai	CAI, Mumbai.	Dr. S.K. Shukla
9.	National Seminar on Potential for Improvement of Indian Ginning Sector	May 26, 2025 Mumbai	ISAE Mumbai Chapter in collaboration with ICAR-CIRCOT	Dr. S.K. Shukla
10.	53 rd Joint Agricultural Research and Development Committee Meeting - 2025' (AGRESCO)	May 29 to 31, 2025 Parbhani	Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani	Dr. S.K. Shukla
11.	Workshop on 'Standardization reforms and online standards development'	June 06, 2025 Mumbai	Bureau of Indian Standards (BIS)	Dr. Sujata Saxena
12.	6 th SEA - AICOSCA Cottonseed, Oil & Meal Conclave - 2025	August 02-03, 2025 Vijayawada	Solvent Extractors Association of India & AICOSCA	Dr. S.K. Shukla Dr. A. Arputharaj
13.	National Workshop on “Design and development of improved hand operated Charkha: A way forward”	August 29, 2025 Wardha	MGIRI, Wardha (A National Institute under the Ministry of MSME, Govt. of India)	Dr. GTV Prabu Dr. Shekh Mukhtar Mansuri
14.	38th National Convention of “Textile Engineers National Seminar on Emerging Challenges of Sustainable Technical Textiles”	September 05-06, 2025 Ghaziabad	The Institute of Engineers (India), Ghaziabad centre	Dr. G. Krishnaprasad
15.	National Conclave on “Weaving India Together – Natural Fibres, Innovation & Livelihoods from the North East and Beyond”	October 07, 2025 New Delhi	College of Community Sciences (CCS), Central Agriculture University (CAU), Imphal, Tura, Meghalaya and Deendayal Research Institute in collaboration with ICAR.	Dr. S.K. Shukla Dr. A.S. M. Raja Dr. A. Arputharaj

Sr. No.	Title	Date & Venue	Organised by	Participating Scientist
16.	4 th Global Cotton Conference	October 07, 2025 New Delhi	CITI, New Delhi	Dr. S.K. Shukla Dr. A.S. M. Raja Dr. A. Arputharaj
17.	Workshop on “Redefining Agriculture Research Ecosystem in Maharashtra-From output to impact”	October 29-30, 2025 Pune	Maharashtra Council of Agricultural Education & Research (MCAER)	Dr. P.S. Deshmukh
18.	National Conference on “Transforming Plant Health Management: Integrating Traditional Practices with Modern Innovations for Global food Security”	December 18-19, 2025 Puducherry	Indian Phyto pathological Society (Southern Zone Chapter) & PAJANCOA & RI, Karaikal, UT of Puducherry	Dr. K. Pandiyan

Chapter 10

10. Events Organized

- *The 76th Republic Day* was celebrated on January 26, 2025 at the Institute and all its regional units. The Director hoisted the national flag at the Mumbai headquarters. Staff members with their children participated.



- *Chhtrapathi Shivaji Maharaj Jayanti* was celebrated on February 19, 2025



- *International Women's Day* was celebrated on March 28, 2025



- *Ambedkar Jayanti* Celebrated on April 25, 2025



- *The World IP Day* was celebrated on May 02, 2025, by organizing a session on topic, 'Innovator's Mindset: Intellectual Property as the Foundation for Scientific Breakthroughs', delivered by Dr. Avinash Thakur, Senior Director at Accures IP Care.



- *The 11th International Day of Yoga 2025* (IDY 2025) was celebrated throughout the month of June 2025 as per directives



of Ministry of Aayush, GOI, with yoga related events being conducted every Friday at the institute starting from May 30, 2025 and culminating in a grand event on June 20, 2025 in commemoration of the International Yoga Day celebrated world-wide on June 21 of every year.

- **World Environment Day:** An awareness session on "Celebrate with Zero waste" in line with the theme for year 2025-- *Ending the plastic pollution*, was conducted by Mrs. Shreelata Menon, Founder, Menons Environment Exclusive (MEE) LLP, Thane on the occasion of World Environment Day on June 05, 2025. An exhibition of various environment sustainable products made by villagers and tribals from all over the country was also arranged by MEE at CIRCOT premises.



- On the occasion of **World Blood Donation Day** on June 14, 2025, a blood



donation camp was conducted at ICAR-CIRCOT on June 16, 2025 by the Sir J. J. Mahanagar Raktakendra, J. J. Hospital Campus, (managed by) State Blood Transfusion Council (SBTC), Government of Maharashtra. A World Blood Donation Day 2025 Pledge was also taken by all employees in the institute on the day.

- **Independence Day:** The institute solemnly celebrated the 79th Independence Day on August 15, 2025. During the period the staff members and their families actively participated in the Har Ghar Tiranga Abhiyaan



- **The Rashtriya Ekta Diwas** commemorating the birth anniversary of Sardar Vallabhbhai Patel, the first Home Minister of independent India was celebrated at ICAR- CIRCOT and its regional units on October 31, 2025, by the staff taking the Ekta Pledge, telecast of an inspiring short film titled,



“Ek Bharat, Shreshtha Bharat and undertaking the Unity Run/Unity Walk by all staff in the area close to the institute premises.

Vigilance Awareness Week was observed in the institute from October 27 till November 02, 2025. An Essay Competition was organized for staff on the Topic, “Vigilance: Our Shared Responsibility” in three languages (English, Hindi and Marathi). A Drawing Competition was also organized for the children of the staff members on the Vigilance Awareness topic. A Sensitization workshop was conducted on October 31, 2025, in which Shri Nikhil Malhotra, DSP, Anti-Corruption Bureau, CBI delivered a lecture on “Vigilance: Our Shared Responsibility”.



Jan Jatiya Gaurav Varsh Pakhwada was celebrated by ICAR-CIRCOT, Mumbai and its regional units during November 1-15, 2025, to commemorate the 150th Birth Anniversary of Bhagwan Birsa Munda, the great tribal freedom fighter and social reformer, with varied awareness activities to honor his legacy and promote awareness and empower the tribal communities.





- *Celebration of 150 years of the nation's National Song, "VandeMaataram"* by participating in virtual mode, during the live telecast of the programme conducted at Indira Gandhi Indoor Stadium at New Delhi on November 07, 2025.



- *Samvidhan Divas (Constitution Day)*, was celebrated by the institute on November 26, 2025, in line with the theme 'HUMARA SAMVIDHAN, HUMARA SWABHIMAAN', and participated in the 'One Nation One Preamble Moment' by reading out the

Preamble of the Constitution at the designated time of 11AM. An essay competition was also held for the staff on the declared theme on November 28, 2025.



- ICAR-CIRCOT, Mumbai, celebrated 102 Foundation Day and Agricultural Education Day on December 3, 2025. Ms. Roop Rashi, CEO, KVIC, GoI, graced the occasion as the Special Guest at the ICAR-CIRCOT premises, Mumbai. Dr. S. N. Jha, DDG (Agril. Engg.), as Chief Guest, Dr. C. D. Mayee, Former Chairman, ASRB, as Special Guest, and Dr. K. Narsaiah, ADG (PE), as Guest of Honour participated and addressed the gathering in virtual mode. About 30 retired employees of ICAR-CIRCOT also attended the celebration. A Brainstorming session on "Traceability, Transparency and Sustainability in the Cotton Value Chain" was organized (in hybrid mode) on the occasion. Invited participants of the session included cotton value chain experts, representatives from textile industries, seed industries, entrepreneurs, farmers, other stakeholders and Scientists and Technical staff of the Institute.



- **ICAR-Sports:** Thirty-four CIRCOT staff participated in the ICAR West Zone Sports Tournament held during February 01-04, 2025 at ICAR-CICR,

Nagpur. Eight gold and five silver medals were won by the staff across various events.



Chapter 11

11. Hindi Implementation

11.1 Meetings of the Official Language Implementation Committee

During the year, a total of four meetings of the Official Language Implementation Committee were held. The meetings were conducted under

the chairmanship of Dr. S. K. Shukla, Director, on 24.03.2025, 30.06.2025, 25.09.2025, and 16.12.2025.

11.2 Hindi Workshops

To enable employees to work proficiently in Hindi, a total of four Hindi workshops were organized at the Institute during the period from 01.01.2025 to 31.12.2025. Scientists, technical personnel, administrative staff, and

skilled support staff of the Institute were imparted training through these workshops. The detailed particulars of the workshops are given in the table below.

S.No	Dates	Subject	No. of Participants
1.	27.03.2025	Contribution of Artificial Intelligence to Hindi	45
2.	09.06.2025	Translation and Typing Using AI Tools	55
3.	13.09.2025	How to Maximize the Use of Hindi in Official Work	45
4.	19.12.2025	Use of Artificial Intelligence in Official Work in Hindi	62

11.3 Official Language Implementation Inspection

Shri Ram Dayal Sharma, Joint Director (Official Language), ICAR, New Delhi, inspected the implementation of the Official Language policy

and related activities being carried out at the Institute on 23.01.2025.

11.4 Celebration of Hindi Day/Fortnight and Hindi Awareness Month

ICAR–Central Institute for Research on Cotton Technology (CIRCOT) celebrated Hindi Day and Hindi Fortnight from 14.09.2025 to 30.09.2025.

The Institute organized Hindi Day/Hindi Fortnight from 15 to 30 September 2025.

A total of 11 competitions, including Hindi Shudhalekha, essay writing, technical terminology, poetry recitation, note writing, Antakshari, crossword puzzle, Unicode typing, and poster exhibition competitions were organised. For the first time, a humorous satire

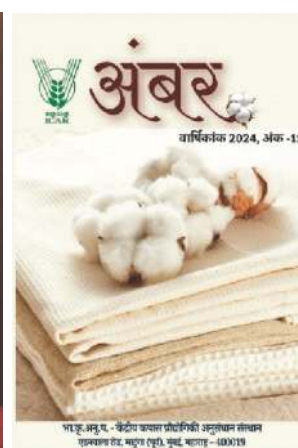
competition was also organized, which received an enthusiastic response from the participants and was successfully conducted.

To mark the conclusion of the Hindi Awareness Month/Hindi Fortnight, an extempore speech competition was held. All officers and employees of the Institute participated enthusiastically in the various competitions organized during the Hindi Fortnight. At the Valedictory Function, Dr. S. K. Shukla, Director, stated that Hindi, as a language, unites people across the country and facilitates greater participation of employees in official work.

The distinguished guests on the occasions include Shri Ajit Kumar Rai, Research Director and Head, Department of Hindi, K. C. College & Associate Editor, Jagruk Times. Dr. C. D. Mayee, President of ISCI, former Chairman of the ASRB & Chief Guest of the function, congratulated the Institute for its excellent efforts in promoting the use of Hindi in day-to-day official work.

Dr. A. S. M. Raja, Principal Scientist and Chairman of the Hindi Day/Hindi Fortnight Organizing Committee, presented a report on the activities conducted during the celebrations. Mrs. Tripti Mokul, Administrative Officer and In-charge, Official Language Cell, highlighted the Institute's annual achievements. On the occasion, the Institute's Hindi magazine, *Ambar*, was formally released by the Chief Guest and other distinguished guests.

Employees who participated in the Incentive Scheme for preparing notes and drafting in Hindi in original in the course of official work were presented with awards for the year 2024-25. The *Official Language Rolling Trophy (Rajbhasha Chal Vijayanti Shield)* for Best Official Language Implementation for the year 2024-25 was awarded to the Administration-I (Personnel Section) in the Administrative Sections category and to the Chemical and Biochemical Processing Division in the Scientific Research Departments category.



11.5 Meetings of the Town Official Language Implementation Committee

Dr. S. K. Shukla, Director of the Institute, participated in the half-yearly meetings of the Town Official Language Implementation

Committee (TOLIC), Mumbai, held on 23.05.2025 and 28.10.2025.

11.6 Hindi Implementation at Regional Units

- A Hindi workshop titled “ए आई उपकरण_के_ सहायता से अनुवाद एवं टंकण” (Artificial Intelligence se Anuvaadva Evam Tankan) was organized by Ginning Training Centre (GTC), Nagpur on June 30, 2025.
- The Ginning Training Centre of ICAR-CIRCOT, Nagpur, has been awarded the Protsahan-II (Encouragement) Certificate by the Nagar Rajbhasha Karyanvayan Samiti, Nagpur (Karyalay-2) for good work in the Hindi language, under the 'offices having upto 50 employees' category for Year 2024. The Award was received from Mr. Jay Prakash Dwivedi, Chairman, NARAKAS, Nagpur (Karyalay-2) on July 28, 2025.
- The Ginning Training Centre organized Hindi Saptah from September 15 to 20, 2025. During the week-long program, a series of activities were conducted for all staff members.
- A workshop in Hindi (hybrid mode) titled “Karyalayein Karyon mein Hindi ka Adhik se Adhik Prayog Kaise Kare” was organized by GTC, Nagpur on September 25, 2025. The session was conducted by Dr. Shashikant Sharma, Head, Hindi Department (Retired), Baba Nanak Sindhi Hindi College, Nagpur.
- ICAR-CIRCOT Quality Evaluation Unit at Surat won the first prize in the Hindi essay writing competition organized by ONGC for the essay titled "An Unforgettable Journey" (Avismaraniya Yatra) on November 20, 2025.



Chapter 12

12. Distinguished Visitors

Visit of Secretary (DARE) & Director General (ICAR) at GTC, ICAR-CIRCOT, Nagpur

Hon'ble Secretary (DARE) & Director General (ICAR), New Delhi, Dr. Himanshu Pathak along with Dr. Y.G. Prasad, Director, ICAR-Central Institute for Cotton Research (CICR), Nagpur and Dr. C. D. Mayee, Former Chairman, ASRB, New Delhi visited the Ginning Training Centre (GTC), Nagpur on January 20, 2025. An industry interface meeting, was conducted by the DG. Also inauguration of the Biomass Torrefaction Pilot Plant, and Office Main Gate & Security Room of Ginning Training Centre (GTC), was done by the dignitaries.



Visit of Former Cabinet Minister

Mr. Sunil Chhatrapal Kedar, Former Cabinet Minister, Maharashtra Government visited Ginning Training Centre (GTC), on February 12, 2025.



Visit of DDG (Agril. Engg.) QEU, Coimbatore

Dr. S. N. Jha DDG (Agril. Engg.) visited Quality Evaluation Unit of Coimbatore on February 17, 2025, alongwith Dr Ravindra Naik, Principal Scientist & Head, ICAR-CIAE, Coimbatore Regional station.



Visit of ICAC Executive Director

Mr. Eric Trachtenberg, Executive Director, ICAC, Washington DC, USA along with Dr. C.D.

Mayee, former Chairman, ASRB, visited Ginning Training Centre, ICAR-CIRCOT, Nagpur on Feb 19, 2025. Saplings were planted under the 'Tree Plantation Drive' by the dignitaries.



Visit of DDG (Agril. Engg.) GTC, Nagpur

Dr. S. N. Jha Deputy Director General (Agricultural Engineering) visited GTC, Nagpur on April 08, 2025 and had an interaction meeting with the CIRCOT R-ABI startups.



Visit of Director General, (CPRI) along with AGM, NTPC & Mission member & Joint Director, CPRI & SAMARTH Mission member

Shri B. A. Sawale, Director General, (CPRI), Bengaluru along with Mr. Nizamuddin, AGM, NTPC & Mission member, Mr. Praful Chandra, Joint Director, CPRI & SAMARTH Mission member visited Ginning Training Centre, Nagpur on April 9, 2025.



Visit of Director, ICAR- Central Coastal Agricultural Research Institute, Goa

Dr Parveen Kumar, Director, ICAR-Central Coastal Agricultural Research Institute, Goa visited Ginning Training Centre, ICAR-CIRCOT, Nagpur on April 21, 2025.

Visit of Hon'ble Union Minister, Maharashtra CM & Secretary DARE and DG ICAR, at NBSSLUP, Nagpur for Review of Viksit Krishi Sankalp Abhiyan

Technologies developed by ICAR-CIRCOT were showcased by Dr. S. K. Shukla and team at the exhibition held during the review of the Viksit Krishi Sankalp Abhiyan by Hon'ble Union Minister Shri Shivraj Singh Chauhan and Maharashtra CM Shri Devendra Fadnavis in the presence of Dr. M. L. Jat, Secretary DARE and DG ICAR, at NBSSLUP, Nagpur on May 18, 2025.



Visit of Hon'ble Union Agriculture Minister

Hon'ble Union Agriculture Minister Shri Shivraj Singh Chauhan during his visit to Mumbai on June 20, 2025, reviewed the activities of ICAR-CIRCOT.



Visit of Professor, Dept. of Mechanical Engineering, IIT-BHU, Varanasi

Dr Prashant Shukla, Professor, Dept. of Mechanical Engineering, IIT-BHU, Varanasi, delivered a lecture on the topic, "Challenges & Way Forward on Industry-Oriented Research" on July 28, 2025, at ICAR-CIRCOT, Mumbai.



Interactive meeting of ADG (PE) with the scientists

Dr. K. Narsaiah, ADG (PE), had an interactive meeting with the scientists of ICAR-CIRCOT on September 17, 2025 at ICAR-CIRCOT, Mumbai.



Visit of Hon'ble Union Minister of State for Textiles and External Affairs

Shri Pabitra Margherita, visited ICAR-CIRCOT, Mumbai, on November 19, 2025, and was the Chief Guest during the live streaming of the programme held for the release of the 21 Kisan Samman Nidhi by the Hon'ble Prime Minister at Coimbatore. The Hon'ble Minister was accompanied by Ms. Roop Rashi, CEO, KVIC, GoI.



Visit of Former Director of ICT Mumbai

Dr. J. B. Joshi, Member of the Rajiv Gandhi Science and Technology Commission, Mumbai, and Former Director of ICT Mumbai, visited the Ginning Training Centre (GTC), Nagpur on November 17, 2025. He was shown around the

facilities available and briefed about the research activities being carried out.

Visit of Union Minister of State for Agriculture and Farmers' Welfare

Shri Ram Nath Thakur, Union Minister of State for Agriculture and Farmers' Welfare,

Government of India, Krishi Bhawan, New Delhi, visited ICAR-CIRCOT, Mumbai on 27th November 2025. The Hon'ble Minister appreciated the efforts and achievements of the institute and urged the institute to strengthen its outreach, especially towards farmers for improving their economic well-being.



Chapter 13

13. Swachh Bharat Abhiyan

13.1 Swachhta Hi Sewa

The institute implemented *Swachhta Hi Sewa: Powering Swachh Bharat Mission* from 15th September-1st October 2025, culminating in the Swachh Bharat Diwas celebration on 2nd October 2025. During the period the institute conducted cleanliness drive on daily basis including cleaning of offices and surrounding premises, cleanliness and sanitation drive in

the village adopted under the Mera Gaon Mera Gaurav Programme, Composting of kitchen and home waste materials, promoting clean & green technologies, Cleaning of public places, nearby gardens and religious places, conducting quiz competitions, walkathons, Street Plays etc.

Table 13.1 Celebration of Swachhta Hi Seva during September 17, 2025 to October 2, 2025

Sr. No.	Date	Activity Undertaken	Participants
1.	17.9.2025	Display of Banner at Prominent Places, Taking Swachhata Pledge, Installation of Selfie Points and Organisation of plantation drive "Ek Ped Ma Ke Naam".	All Staff
2.	18.9.2025	Transformation of Cleanliness Target Units	Staff at HQ, Mumbai and Sirsa unit
3.	19.9.2025	Engagement with school children (Drawing competition)	Students
4.	20.9.2025	Swachhata Samvad: Street Play	All Staff, Students
5.	21.9.2025	Preventive Health Check-ups	Sanitation workers and their families, All Staff
6.	22.9.2025	Human Chain: Symbolic event where staff came together and joined hands to raise awareness and demonstrate commitment to cleanliness and sanitation	Staff at HQ, Mumbai
7.	23.9.2025	Clean Green Utsav: Carrying out cleaning activities in the Institutional buildings	All Staff
8.	24.9.2025	Tourist Spots cleaning: Cleanliness drive at Five Gardens along with Guru Nanak Khalsa College, Matunga Student	Staff at HQ, Mumbai & Students
9.	25.9.2025	Ek Din Ek Ghanta Ek Saath: Cleanliness drive at Mahim Staff Quarters	Residents at Mahim Quarters
10.	26.9.2025	Best Innovation under Swachh Bharat Mission (SBM) – Cultural Fest	Students
11.	27.9.2025	Waste to Art Initiative	Staff at GTC, Nagpur

Sr. No.	Date	Activity Undertaken	Participants
12.	28.9.2025	Facilitation of access to comprehensive health services for Safai Mitras, sanitation workers and their dependents	Sanitation workers
13.	29.9.2025	Distribution of PPE Kit and safety gear to sanitation workers	Sanitation workers
14.	30.9.2025	Social Welfare Linkages and Registration of Sanitation Workers	Sanitation workers
15.	01.10.2025	Religious Leader Engagement and Media Outreach	Staff at GTC, Nagpur
16.	02.10.2025	Swachh Bharat Diwas	Local NGO and staff

13.2 The Swachhta Pakhawada

The Swachhta Pakhawada, was organized during December 16-31, 2025, with various

activities conducted at Mumbai Headquarters and regional centres.

Table 13.2 Celebration of Swachhta Pakhawada during December 16-31, 2025

Sr. No.	Date	Activity Undertaken	Participants
1.	16.12.2025	Swachhta pledge and display of Swachhta Banner at prominent places	All Staff
2.	17.12.2025	Training program to educate the participants about converting waste cotton rags or waste paper into writing pads or folders	Trainees and NGO
3.	18.12.2025	Review and weeding out of old records, e-office implementation / Digitalization of office records	All Staff
4.	19.12.2025	Cleanliness and Sanitation Drive in the office premises	All Staff
5.	20.12.2025	Campaigns on discarding the use of Single Use Plastics	All Staff, Students
6.	21.12.2025	Shraamdaan activities conducted in residential colony at Mahim, Mumbai and in the villages adopted under the Mera Gaon Mera Gaurav programme	All Staff
7.	22.12.2025	Nukkad: Street play	All Staff, Students
8.	23.12.2025	Kisan Samman Diwas	All Staff
9.	24.12.2025	Drawing competition	Students
10.	25.12.2025	Door to door signature campaign for maintaining Cleanliness	Staff at Sirsa unit

Sr. No.	Date	Activity Undertaken	Participants
11.	26.12.2025	Campaign on cleaning of sewerage & water Lines	Staff at Sirsa unit
12.	27.12.2025	Shraamdaan activities	Staff at Guntur unit
13.	28.12.2025	Demonstration on advance sustainable waste Management and foster environmental responsibility	Staff at HQ, Mumbai
14.	29.12.2025	Swachhata Runs, walkathon/Swachhta Rally	Staff at HQ, Mumbai
15.	30.12.2025	Involvement of dignitaries in the Swachhta activities	Staff at GTC, Nagpur
16.	31.12.2025	Stakeholder's meeting for creation of Awareness about sanitation practices	Staff at GTC, Nagpur

Photo Gallery of Swachh Bharat Abhiyan in 2025



Swachhata walkathon/Swachhta Rally



Swachhata Pledge



Display of Banner at Prominent Places



Social Welfare Linkages and Registration of Sanitation Workers



Health Check-up of Sanitation Staff



Nukkad : Street play



Cleanliness and Sanitation Drive at public place



Distribution of PPE Kit and safety gear to sanitation workers

Chapter 14

14. Outreach Activities

Awareness programme – Farmers (15)

Viksit Krishi Sankalp Abhiyan:

Thirteen teams of CIRCOT scientists conducted about 585 awareness programmes during the Viksit Krishi Sankalp Abhiyan (VKSA), impacting/reaching out to about *one lakh farmers* across seven districts (Akola, Buldhana, Bhandara, Chandrapur, Nagpur, Thane & Wardha) of Maharashtra during the period from May 29-June 12, 2025.

Pradhan Mantri Kisan Samman Nidhi (PM-KISAN)

1. An Awareness programme on best farm practices was conducted along with webcasting of “PM Kisan Samman Nidhi” on August 2, 2025 at Village Seloo, Dist. Wardha. Total 49 Farmers (including 9 women farmers) attended.
2. On October 11, 2025, programme was organized for farmers under *Pradhan Mantri Dhan-Dhaanya Krishi Yojana (PMDDKY) and National Mission on Pulses* at Village Wadgaon (Rajdi), District Amravati, in which 226 farmers including 54 women farmers participated.



3. The GTC, Nagpur organized an awareness programme for farmers on November 19, 2025, which coincided with the live streaming of event, during which the Hon'ble Prime Minister Shri Narendra Modi released the 21st instalment of the Pradhan Mantri Kisan Samman Nidhi (PM-KISAN). A total of fifteen farmers, including four women, participated in the programme.

Awareness Programmes under MGMG:

4. On October 11, 2025, an awareness programmes was organized for farmers under *Pradhan Mantri Dhan-Dhaanya Krishi Yojana (PMDDKY) and National Mission on Pulses*, at Village Mohpa, Kalmeshwar, District Nagpur, with participation of about 206 farmers, including 12 women farmers.
5. A program on World Cotton Day on the theme, “World Cotton Day: Empowering Farmers through Cotton”, was organized on October 07, 2025. About 100 farmers, including seven women farmers, participated.

6. The Ginning Training Centre (GTC), ICAR-CIRCOT, Nagpur organized an awareness program on “Fibre quality parameters and by-products utilization” under MGMG at Village Savandri, Kalmeshwar, Nagpur on November 06, 2025. Total 50 farmers (including 1 female farmer) attended the program.
7. Ginning Training Centre, Nagpur organized an awareness program on “Clean Cotton Picking” under MGMG at Village Vathoda, Kalmeshwar, Nagpur on December 04, 2025. Total 20 farmers (including 4 female farmer) attended the program.
8. GTC, Nagpur organized an awareness programme on December 23, 2025, on the occasion of National Farmers' Day, in association with CITI-CDRA, Mumbai and TEXPROCIL, Mumbai, in which 130 farmers (115 male & 15 female) were present. This event was part of the Kisan Samman Diwas organized by ICAR through online mode in which all the staff of ICAR-CIRCOT, Mumbai, GTC, Nagpur and regional stations and other stakeholders attended. About 200 participants attended the programme, including 130 farmers.

Awareness Programmes under SCSP:

9. Awareness programme on Production of Quality Bales was organised on January 08, 2025 at M/s Mahalaxmi Industries, Dhapewada, Nagpur. Total 25 people including farmers and workers of Ginning Industry were present in the program.
10. An Awareness programme on “Production of Quality Bales” was organised on January 10, 2025 at Village Borgaon, Taluka Kalmeshwar, Nagpur. About 15 farmers (including eight women) participated.
11. An Awareness programme on “Production of Quality Bales” Under SCSP scheme at Dipori village, Dist. Amravati on September 16, 2025, 71 farmers participated.

Jan Jatiya Gaurav Varsh Pakhwada

As part of activities conducted by ICAR-CIRCOT during the Jan Jatiya Gaurav Varsh Pakhwada to Commemorate the 150th Birth Anniversary of Bhagwan Birsa Munda during November 1-15, 2025, the following awareness activities were conducted,

12. Teams from Mumbai HQs of CIRCOT visited tribal villages/blocks at Shahapur, Naupada, places which are in and around the Mumbai region and organized outreach and awareness programme in the villages, focused on empowerment of tribal communities. Information about institutional linkages and activities propagated by the GOI for the welfare of the tribal communities were given to the people.
13. Public awareness campaign was organized by GTC, Nagpur on November 12, 2025 at Village Kora (Vashi), District Wardha. Twenty-five farmers (all male) attended.
14. A program on “Tribal Agri Entrepreneurship Summits: Connecting Farmers and Agri Start-ups” was organized at GTC, Nagpur on November 13, 2025 at Village Yerkheda, District Chandrapur. Total 22 farmers (all male) benefited from the program.
15. A demonstration of green cotton biomass silage to create awareness among farmers regarding the silage production and application was provided to the farmers of Vambori village, Tal. Rahuri Dist. Ahilyanagar on November 21, 2025..

Demonstration/Awareness Programme: Other stakeholders (07)

1. Seven staff members from ATMA, Chhindwara, M.P. visited Ginning Training Centre, Nagpur on November 24, 2025
2. Thirty-eight (38) trainees (including 9 female trainees) from Regional Agriculture Management & Extension Institute, (RAMETI), Nagpur visited GTC, Nagpur on January 14, 2025. They were demonstrated the facilities of GTC.
3. Eighteen trainees from the Directorate of Marketing and Inspection, Nagpur visited Ginning Training Centre (GTC), Nagpur of ICAR-CIRCOT on July 14, 2025 for demonstration of various activities of the Ginning Training Centre.
4. A group comprising 12 members of Advisory Board on Ginning Technology Course, from Institute of Engineers, Nagpur unit & Engineering colleges in Nagpur, visited Ginning Training Centre (GTC), Nagpur on August 12, 2025.
5. A group of 10 Agriculture Officer (including 2 females) of Government of Tamilnadu, from Thanjavur, Tamilnadu visited Ginning Training Centre (GTC), Nagpur on October 27, 2025 and had an orientation about the various cotton ginning technologies, ongoing research activities, and the training facilities available at GTC.
6. ICAR-CIRCOT, Mumbai in collaboration with TEXPROCIL and SIMA, Coimbatore organised a one-day awareness Programme on Sustainability of Indian Cotton with Special Reference to Kasturi Cotton on November 05, 2025 at SIMA, Coimbatore.
7. Faculty from GH Raisonni, Nagpur and Tulsiram Gaikwad Patil College, Nagpur

along with personnel from BSIL, Nagpur visited Ginning Training Centre (GTC), Nagpur on November 04, 2025 and during November 20-21, 2025. During the three-day visit, they were briefed about the different types of ginning technologies and the research being carried out at the centre. The team visited the various facilities and infrastructure available at GTC.

Stakeholders/ Industry Interface meet (10)

1. An Industry interface meet organized at Ginning Training Centre, Nagpur on January 20, 2025, in the presence of Dr. Himanshu Pathak, Secretary (DARE) and DG (ICAR). Stakeholders from different industries, Vidarbha Cotton Association and cotton traders and other stakeholder in cotton value chain participated.
2. A stakeholders meeting was held under chairmanship of Dr. S. K. Shukla, Director, ICAR-CIRCOT, on March 21, 2025 during the AICRP on Cotton Annual Group Meeting, to discuss about benchmarking of ginning percentage in variety identification and release. Three private breeders, ICAR-CIRCOT and ICAR-CICR officials participated in the meeting.
3. An interaction meeting with startups incubated at CIRCOT R-ABI was organized at ICAR CIRCOT, Mumbai on April 08, 2025, under the chairmanship of Dr. S. N. Jha, Deputy Director General (Agricultural Engineering), ICAR, New Delhi. The event witnessed the active participation of fifteen startups, who shared their innovations, challenges, and growth journeys during the session.
4. A stakeholder meet was organized at GTC, Nagpur on April 09, 2025 in the presence of Dr. S.N. Jha, DDG, Agricultural Engineering, ICAR. Stakeholders

representing MSCCGMF Ltd., CITI-CDRA, M/s. Bajaj Steel Industries Ltd., M/s. Daftari Agro Biotech, Wardha, M/s. Mahalaxmi Industries, M/s Precision tooling, Nagpur, Gramkalyan, Nagpur, M/s Vidharbha Sales, Nagpur, and progressive farmers and cotton brokers' from Nagpur participated.

5. Dr S. K. Shukla, Dr. A. S. M. Raja and Dr V. G. Arude attended stakeholder's consultation on increasing cotton productivity under the chairmanship of Hon'ble Minister of Agriculture and Farmers Welfare & Rural Development, Shri. Shivraj Singh Chouhan at ICAR-SBI, Coimbatore on July 11, 2025.
6. Dr. N. Vigneshwaran, Head In charge CBPD and Dr. Ajinath Dukare had a meeting with M/s. Megabags, Pune on August 19, 2025 at ICAR-CIRCOT Mumbai to discuss modalities about licensing of technology on 'Nanosilver finished cotton textiles for packaging'.
7. Dr. N. Vigneshwaran, Head (Incharge) CBPD, and Dr. A. Arputharaj attended online meeting with M/s. Aditya Birla regarding cotton linter pulp for dissolving grade pulp application, on September 4, 2025.
8. Dr. A. S. M. Raja, Head QEID attended an online meeting organized by ICAR-CICR, Nagpur for fixing benchmark for various parameters under AICRP on Cotton on September 9, 2025.
9. Dr. A. S. M. Raja, Head, QEID and Dr. C. Sundaramoorthy had online interaction with representatives of Better Cotton Initiative (BCI) regarding collaboration for capacity building in the domain of fibre quality on September 23, 2025.

10. Dr. N. Vigneshwaran and Dr. Ajinath Dukare attended an online Stakeholder Consultation Meeting on, "DNA-Based Method for Purity and Adulteration Analysis in Textiles", arranged by Secretary (Textiles), Textiles Committee (GOI), TEXPROCIL in coordination with NBRI, on November 04, 2025.

Exhibition participation: (10)

1. Participated in the National Natural Fibre Festival (NNFF) 2025 organised on the occasion of the 87th Foundation Day of ICAR-NINEFT, Kolkata during January 02-04, 2025



2. Participated in 'Ananta-Exhibition and conclave with theme of Sustainability' conducted by IMC, Mumbai during January 09-10, 2025 at the Nehru Centre, Worli, Mumbai
3. The research products developed under the NTTM project "Development of High-Performances Woven Protective Gloves and Seamless Knitted Gloves for Industrial Uses" were displayed at the "Research Zone" during the event Bharat Tex 2025 (Textile/Fashion/Sustainability) organized Ministry of Textiles held at Bharat Mandapam, New Delhi during February 14-17, 2025.
4. CIRCOT R-ABI showcased and promoted

startup products at Ogilvy & Mather Pvt Ltd exhibition held as celebration of 'Earth Day' on April 23, 2025.

5. Technologies developed by ICAR-CIRCOT were showcased by Director, CIRCOT Dr. S. K. Shukla and team at the exhibition held during the launch of the Viksit Krishi Sankalp Abhiyan by Hon'ble Union Minister Shri Shivraj Singh Chauhan and Maharashtra CM Shri Devendra Fadnavis in the presence of Secretary DARE and DG ICAR, Dr. M. L. Jat, at NBSSLUP, Nagpur on May 18, 2025. On this occasion, the National Soil Spectral Library developed by NBSSLUP, Nagpur was also launched. All the dignitaries visited the ICAR-CIRCOT stall during the exhibition and appreciated the work being done by the institute.
6. ICAR-CIRCOT participated in the exhibition arranged during the 97th Foundation Day of ICAR at ICAR-New Delhi on July 16, 2025.
7. ICAR-CIRCOT participated in the National Conclave on "Weaving India Together – Natural Fibres, Innovation & Livelihoods from the North East and beyond" held at the NASC Complex, New Delhi during October 05-09, 2025 and showcased technologies developed by the Institute.



8. ICAR-CIRCOT Ginning Training Centre (GTC), Nagpur participated in Agrovision-

2025 and showcased ICAR-CIRCOT technologies at the event held at RTMNU Ground, Amravati Road, Nagpur from November 21-24, 2025.

9. ICAR-CIRCOT R-ABI showcased institute technologies at the National Agri Startup Expo 2025 during December 05–06, 2025 at Dharwad, Karnataka.
10. The Institute participated in Kisan Agri Expo-2025 at Pune during December 10-11, 2025 along with its R-ABI agri startups.

Exhibition organised: (03)

1. A Kisan Mela was organised by CITI-CDRA, Nagpur, at Ginning Training Centre (GTC), Nagpur on March 16, 2025. The event was funded under the National Food Security Mission (NFSM) and was a joint initiative of Ministry of Agriculture and Farmers Welfare and Ministry of Textiles, implemented by ICAR-CICR, Nagpur in association with GTC, ICAR-CIRCOT, Nagpur. Total 200 male farmers and 35 female farmers participated in the program.



2. An exhibition cum sale was organized at ICAR-CIRCOT Mumbai premises on November 14, 2025 during the Jan Jatiya Gaurav Varsh Pakhwada organized to commemorate the 150th birth anniversary of the great tribal leader Bhagwan Birsa Munda. The exhibition had a diverse range of tribal artisan made products such as

traditional handicrafts, handmade bags, artefacts, indigenous food products, and several other innovative and utility items. About five stalls were set up and about 150 people including staff members, students, and visitors actively participated and purchased products. The event served as a platform to raise awareness about tribal heritage and encourage wider recognition of



indigenous skills and sustainable products.

3. An exhibition of textiles and textile products was organized at ICAR-CIRCOT Mumbai premises on November 19, 2025, during the visit of Minister of State for Textiles and External Affairs Shri Pabitra Margherita to the institute.



Mass Media

Newspaper/E-Paper Articles: (26 + about 100 of VKSA)

1. Article, "ICAR DG takes stock of Ginning Training Centre", was published in The Times of India (Nagpur Edition) dated January 21, 2025.
2. Report titled, Kendriya Krishi Vibhaag Mahasanchalak Ke Haathon Satyekaar Sammanit" (in Hindi), about the felicitation accorded to a progressive farmer, Shri Sanjay Satyekaar, who has successfully adopted high density cotton farming (HDPS), by DG, ICAR, on January 20, 2025, in the presence of Director CIRCOT, Director CICR, Nagpur and other dignitaries, was reported in the Dainik Bhaskar (Nagpur Edition) on January 25, 2025.
3. A report on the Kisan Mela organized at

auditorium of ICAR-NBSS & LUP at Ginning Training Centre (GTC), Nagpur on March 16, 2025 titled, "Vidharbhat Kaapsaachi Utpaadakta Vaadhali" (in Marathi), was reported in the Aapla Nagpur (Nagpur Edition) on March 18, 2025.

4. Article titled, 'Concerns expressed over contamination in cotton', is published in The Hindu Bureau, Vijaywada edition dated 23-03-2025, based on discussions conducted during the AICRP on Cotton Annual Group Meeting held during March 21-22, 2025 at the Regional Agriculture Research Station (RARS), in Lam at Guntur.
5. Articles in Telegu language regarding AICRP on Cotton Annual Group Meeting and contamination concerns in cotton, held during discussion in the AICRP on Cotton during March 21-22, 2025 at the Regional

Agriculture Research Station (RARS), in Lam at Guntur, were published in epaper.sakshi.com, Andhra Pradesh Main dated 22-03-2025.

6. Article titled, "CIRCOT-BSIL develop revolutionary pre-grooved rollers technology", published (electronic) in Times of India (TOI) Nagpur News, dated May 20, 2025.
7. Print article titled, "CIRCOT-BSIL make pre-grooved rollers tech", published in The Times of India, Nagpur edition on May 20, 2025.
8. An article on the venture journey of one CIRCOT R-ABI startup, M/s Biological Research Innovation Centre and Solutions LLP was published in "Vikrama" a Kannada weekly Magazine, on May 04, 2025.

The following **three articles** were published in Newspapers about the 6-days training program for farmers from Boudh district Odisha on the theme 'Best Production Practices, Processing of Cotton and Value-addition to Cotton by-products', conducted at Ginning Training Centre (GTC), Nagpur of ICAR-CIRCOT during June 16-21, 2025,

9. Article in Marathi Newspaper "Sakal" on June 21, 2025 titled "Vishesh Kapus Prashikshan Karyakram".
10. Article in Hindi Newspaper "Nagpur Metro Samachar" on June 21, 2025 titled "Odisha Ke Kisanokeliye Nagpur me Vishesh Kapas Prashikshan Karyakram Aayojit".
11. An article in English Newspaper "The Times of India" on June 21, 2025 titled "CIRCOT Ginning Centre holds workshop for Odisha farmers".
12. Approximately about **100 news articles** about CIRCOT scientists' participation in

the Viksit Krishi Sankalp Yatra (VKSA), during May 29-June 12, 2025, were published in Marathi, Hindi & English languages in various newspapers (print & online).

13. Article titled, 'ICAR-CIRCOT, Bajaj Steel develop industrial cottonseed dryer', was published in The Hitavada (Nagpur), dated August 07, 2025
14. Article published in Nagpur post on August 7, 2025 titled "ICAR-CIRCOT-Bajaj develops industrial cottonseed dryer to boost cottonseed oil recovery and cake quality"
15. Article titled, '2 Ngp firms adopt new dryer to boost cottonseed quality was published in Times of India, on August 11, 2025.
16. Article titled, 'CIRCOT, Bajaj develop industrial cottonseed dryer', published online at [https://timesofindia.indiatimes.com/city/nagpur/circot-bajaj-develop-industrial-cottonseed-dryer/ article showprint/123223161.cms?val=3728](https://timesofindia.indiatimes.com/city/nagpur/circot-bajaj-develop-industrial-cottonseed-dryer/article-showprint/123223161.cms?val=3728), on August 11, 2025.
17. Article published in Agrovani newspaper titled "Kapus Utpadakata Vaadd Kendra Sarkarcha Agenda war" (in Marathi) on October 08, 2025.
18. Article published in Newspaper Nagpur Post dated October 09, 2025, titled "World Cotton Day celebrated at Ginning Training Centre, ICAR-CIRCOT, Nagpur".
19. Article published in Marathi Newspaper Mahasagar titled "Ginning Training Centre, ICAR-CIRCOT yethe Jagtik Kapus Din Sajara" on October 9, 2025.
20. Article published in hindi newspaper Dainik Bhaskar titled "Kapas Upaj Vriddhi

me Yogdan ke liye Satyekarsammanit" on October 10, 2025.

21. Article published in Dainik Bhaskar titled "Vishva Kapas Diwas Manaya Gaya" on October 14, 2025.
22. Article published in Dainik Bhaskar newspaper titled "Phasalon Ki Vrudhi Mein Adbhut Parinaam" (in Hindi) about M/s. Kolba Organics LLP, a startup funded by CIRCOT RKVY for generating/making vermicompost from cotton ginning mill waste on November 23, 2025.
23. An article on a special workshop for farmers organized by CITI-CDRA, ICAR-CICR and ICAR-CIRCOT in Nagpur was published on December 05, 2025 in Dainik Sinhvani, a local newspaper in Nagpur (in Marathi).
24. The 102nd Foundation Day Celebration of ICAR-CIRCOT was reported in Agrowon date December 09, 2025.
25. Article titled, "Ginning Training Centre, ICAR-CIRCOT celebrates National Farmers' Day", published in Hitavada (Nagpur Edition) dated December 24, 2025
26. News report titled, "Rashtriya Kisan Divas Manaaya" was published in Dainik Bhasker (Hindi) on December 27, 2025, on celebration of National Farmers' Day at GTC, Nagpur on 23-12-2025.

Visual Media (TV/Radio/ social media) Coverage: (02)

TV Coverage : The technological and scientific intervention of ICAR-CIRCOT in the post-

harvest processing of cotton and benefit of the interventions to the cotton farmer was showcased in the visual format in the programme "Chaupal Charcha: Kisan Aur Vigyan" (in Hindi), telecast on the **DD Kisan Channel** on May 14, 2025. The programme can also be viewed in the You Tube @dd kisan channel.

Radio Talk : (in Marathi) by Dr. Prashant S. Deshmukh, Principal Scientist, on the topic "Viksit Krishi Sankalp Abhiyan – Success of Kharif Crops and Preparation for Rabi Crops" was broadcast by All India Radio on September 18, 2025, during the "Mazha Aawar Mazha Shiwar" programme on Asmita channel.

Social Media : ICAR-CIRCOT showcases its activities, technologies, events etc. on the website page and also on its social media handles. During the period January- December 2025, total 257 posts were published on each social media (Facebook, X (Twitter), YouTube & Instagram) including the website of the Institute. Besides, scientists also share research development and activities on their Linked-In pages and social media handles.

Website & Social Media	Followers (up to Dec 2025)
Website	26253
Facebook	2117
X (Twitter)	873
YouTube	553
Instagram	208

Chapter 15

15. Infrastructure

ICAR-CIRCOT is recognised as Referral Laboratory for cotton fibres and is an NABL accredited Laboratory for Mechanical and Chemical test. The Institute is equipped with state-of-the-art facilities for conducting research in post-harvest processing of cotton & allied fibres and value addition to crop residues and also provide commercial services to the stakeholders. Some of the facilities available in the Institute include,

Laboratory Facility : Fibre, Yarn and Fabric Testing Laboratory, Nanocellulose Pilot Plant Facility, National Laboratory for Advanced Material Characterization, National Biomass Characterization Facility, Electrospinning Facility, Composite Lab facility, Genomics Laboratory

Pilot Plant Facility : Modern Ginning and Pressing Plant, Cottonseed Processing Plant, Particle Board Manufacturing Plant, Pelleting Plant, Computerised sample Weaving Facility, Torrefaction Plant

Other Unique research and instrumentation facility : Scanning Electron Microscopy (SEM); DREF Spinning Machine; Kawabata Evaluation System (KES); Atomic Force Microscopy (AFM); Thermo Gravimetric Analyser; Fourier Transformation Infrared Spectrometer; Atomic Absorption Spectrometer; Ultra High- Pressure Homogenizer; Particle size analyser; Gas Chromatography with Mass Spectrometer.

The new Facilities created in the institute during the current year are,

At Mumbai Headquarters:



USTER HVI 1000 Machine



Speed Frame Machine



Bio-digester



Real Time PCR in Genome Editing Laboratory



Grading laboratory with USDA colour grading boxes of cotton, for training and demonstration purpose



SMART Textiles Laboratory with 3D printing facility



Deep Groove forming Machine



Scanning Electron Microscope (SEM)



Air Jet Cleaner System



A working facility of "Double roller ginning machine" for training and demonstration purpose



Microbiology Lab facility at GTC, Nagpur

Research facilities acquired for the Microbiology Lab at GTC,



BOD Incubator



Centrifuge



Digital Rotary Shaker

At Quality Evaluation Unit [QEU], Guntur



**Fully Automatic High-Volume Instrument
for Cotton Testing**

Annexure I

List of Ongoing Research Projects

Project Code	Project Title	PI/Co-PI	Duration
MP.106	Refinement in heating and cottonseed conveying system of cottonseed dryer	Dr. Varsha Satankar (PI) Dr. S.K. Shukla Dr. S.V. Ghadge Dr. K. Pandiyan	2024-26
MP 108	Evaluation of effectiveness of air jet cleaner for trash control in ginning industry to qualify Kasturi cotton trash standards	Dr. V.G. Arude (PI) Dr. Varsha Satankar	2025-27
MP 109	Development and standardization of Contamination Measurement Techniques in Cotton	Dr. Shekh Mukhtar Mansuri (PI) Dr. Himanshushekhar Chaurasia Dr. S. V. Ghadge	2025-27
MP 110	Development and Evaluation of seed cotton storage bag with antimicrobial finish	Dr. A. K. Bharimalla (PI) Dr. N. Vigneshwaran Dr. C. Sundaramoorthy Dr. A. Arputharaj Dr. K. Pandiyan Dr. M.K. Mahawar Dr. Sheshrao Kautkar Dr. Jyoti Dhakane-Lad Dr. Kirti Jalgaonkar Dr. Sharmila Patil	2025-27
CORE AREA II: MECHANICAL PROCESSING, TECHNICAL TEXTILES AND COMPOSITES			
MP.102	Evaluation of electrospun nano fiber based multi - nutrient sachet for high-value crops	Dr. G.T.V. Prabu (PI) Dr. N. Shanmugam Dr. Kanika Sharma Dr. Sujata Saxena Dr. M.K. Mahawar	2023-26
MP 111	Development of Quality Norms for Rotor spinning of indigenous cotton and its value addition	Dr. N. Shanmugam (PI) Dr. T. Senthilkumar Dr. G. Krishnaprasad	2025-27

Project Code	Project Title	PI/Co-PI	Duration
CORE AREA III: CHARACTERISATION OF COTTON AND OTHER NATURAL FIBRES, YARNS AND TEXTILES			
A.1	All India coordinated research project on cotton (Quality Research)	Dr. A.S.M. Raja (PI) Dr. A. Arputharaj Dr. G.T.V. Prabu Dr. T. Senthilkumar Dr. P. Jagajanantha Dr. N. Shanmugam	2021-26
QE.115	Development of portable instrument to measure the colour grade of cotton. (Project continued under RGSTC-2025/295)	Dr. P. Jagajanantha (PI) Dr. A.S.M. Raja Dr. Kirti Jalgaonkar	2023-25
QE.116	Development of Process protocol for ICAR-CIRCOT calibration cotton for standard reference material certification	Dr. Kirti Jalgaonkar (PI) Dr. A.S.M. Raja Dr. Sharmila Patil Dr. N. Shanmugam Dr. G. Krishnaprasad Dr. Sundaramoorthy C	2024-27
QE.117	Development of image-based trash measuring device using artificial intelligence	Dr. Himanshushekhar Chaurasia (PI) Dr. N. Shanmugam Dr. T. Senthilkumar	2024-27
QE.118	Development of AI based portable device for non-destructive measurement of ginning percentage (GP)	Dr. Sharmila Patil (PI) Dr. P. Jagajanantha Dr. Kirti Jalgaonkar Dr. A.S.M. Raja Dr. Shekh Mukhtar Mansuri	2025-27
CORE AREA IV: CHEMICAL AND BIOCHEMICAL PROCESSING AND BIOMASS & BY-PRODUCT UTILISATION			
CH.104	Effects of process parameters on cottonseed oil extraction.	Dr. Jyoti Dhakane -Lad (PI) Dr. Kirti Jalgaonkar Dr. Kanika Sharma Dr. Sujata Saxena	2023-26
CH.105	Evaluation of cotton seed hull for production of furfural.	Dr. Manoj Kumar (PI) Dr. Kanika Sharma Dr. Sujata Saxena Dr. Ajinath Dukare	2023-26

Project Code	Project Title	PI/Co-PI	Duration
CH.106	Development of microbial enzyme-mediated delinting process from cottonseeds.	Dr. K. Pandiyan (PI) Dr. Ajinath Dukare Dr. Sheshrao Kautkar Dr. A.S.M. Raja	2023-26
II.11	Development of antimicrobial cotton textile for post-harvest packaging and handling of flowers	Dr. Ajinath Dukare (PI) Dr. N. Vigneshwaran Dr. A. Arputharaj Dr. Jyoti Dhakane -Lad Dr. Kanika Sharma	2024-26
ICAR-Genomic Research	Engineering microbial factories for enhanced xylitol production from cotton lignocellulosic biomass using CRISPR/Cas9 technology	Dr. Manoj Kumar (PI) Dr. Kanika Sharma Dr. Ajinath Dukare Dr. K. Pandiyan	2023-26
II. 10	Microbial electrolysis cell (MEC) for efficient production of hydrogen gas from cotton biomass	Dr. N. Vigneshwaran (PI) Dr. A. Arputharaj Dr. Ajinath Dukare Dr. Kanika Sharma Dr. A.K. Bharimalla Dr. P. Jagajanantha Dr. K. Pandiyan	2024-27
CORE AREA V: ENTREPRENEURSHIP AND HUMAN RESOURCE DEVELOPMENT			
TT.12	Impact assessment of CIRCOT technologies.	Dr. Sundaramoorthy C. (PI) Dr. A.K. Bharimalla Dr. Himanshushekhar Chaurasia	2020-26
TT.14	Development of project profile, data bank and entrepreneurship in cotton processing.	Dr. D.M. Kadam (PI) Dr. N. Shanmugam Dr. P. S. Deshmukh Dr. Sundaramoorthy C. Dr. A.S.M. Raja Dr. G. T. V. Prabu	2023-26
EXTERNALLY FUNDED PROJECTS			
CRG/2023/003974	Development of High Production Double Roller Gin for Enhancing Viability of Cotton Ginning Industry	Dr. V.G. Arude (PI) Dr. S.K. Shukla Dr. Kirti Jalgaonkar Dr. Varsha Satankar	2024-27

Project Code	Project Title	PI/Co-PI	Duration
RGSTC 2025/294	Design and Development of Seed Cotton Baling Machine for Effective Handling and Storage	Dr. M. K. Mahawar (PI) Dr. Sheshrao Kautkar Dr. Jyoti Dhakane -Lad Dr. A.K. Bharimalla Dr. Varsha Satankar Dr. Shekh Mukhtar Mansuri	2025-28
1014584 (NASF)	Development of smart foods, bio-composites, green packaging and bio energy from agro biomass	Dr. A. Arputharaj (PI) Dr. N. Vigneshawaran Dr. T. Senthilkumar Dr. A.S.M. Raja Dr. Sharmila Patil	2023-27
1015052 (NTTM)	Development of high performance woven protective gloves and seamless knitted gloves for industrial uses	Dr. G. Krishna Prasad (PI) Dr. N. Shanmugam Dr. A.S.M. Raja	2024-26
RGSTC 2025/295	Development of portable instrument to measure cotton quality at farm gate and textile industries	Dr. P. Jagajanantha Dr. A.S.M. Raja Dr. Kirti Jalgaonkar Dr. Sharmila Patil Dr. Shekh Mukhtar Mansuri	2025-28
TXD 0272 (BIS)	Study to develop standard test method for determination of lint and trash content of cotton	Dr. P. Jagajanantha (PI) Dr. A.S.M. Raja Dr. G.T.V. Prabu Dr. Sharmila Patil	2025-26
1013645 (TPP- Biomass)	Characterization and utilization of paddy straw and other agro residues for conversion into pellets for co-firing in thermal power plants (TPP)	Dr. Arputharaj (PI) Dr. S.K. Shukla Dr. A.S.M. Raja Dr. T. Senthilkumar Dr. K. Pandiyan Dr. Varsha Satankar	2021-26
IGSTC/SING -2024/01654	Safety of Cottonseed protein isolate for human consumption: Validation through in-vitro toxicological studies	Dr. Manoj Kumar (PI)	2025-26

Project Code	Project Title	PI/Co-PI	Duration
1007815	Agri-Business Incubation Centre at ICAR-CIRCOT, Mumbai.	Dr. A. K. Bharimalla (PI) Dr. Sundaramoorthy C. Dr. K. Pandiyan Dr. G. Krishnaprasad Dr. Manoj Mahawar Dr. Kirti Jalgaonkar Dr. Sharmila Patil Dr. Jyoti Dhakane -Lad Dr. Sheshrao Kautkar Dr. Ajinath Dukare	2019-26
1011105	Remunerative approaches for agriculture and allied sectors rejuvenation (RAFTAAR) agri business incubator (R-ABI).	Dr. A. K. Bharimalla (PI) Dr. Sundaramoorthy C. Dr. K. Pandiyan Dr. G. Krishnaprasad Dr. Kirti Jalgaonkar Dr. Manoj Mahawar Dr. Ajinath Dukare Dr. Sheshrao Kautkar Dr. Sharmila Patil Dr. Jyoti Dhakane -Lad Dr. Himanshushekhar Chaurasia	2019-26
CONSORTIA RESEARCH PLATFORM ON NATURAL FIBRES (CRP on NF)			
CRP-CIRCOT-11	Development and evaluation of Pre-grooved chrome leather roller and automatic deep-cut grooving machine for double roller gin.	Dr. Seshrao Kautkar (PI) Dr. S.K. Shukla Dr. V.G. Arude	2023-26
CRP-CIRCOT-12	Optimization of spinning process parameters for Cotton/Hemp blends and develop value added products.	Dr. T. Senthilkumar (PI) Dr. N. Shanmugam Dr. A.S.M. Raja	2023-26
CRP-CIRCOT 13	Development of Biorefinery Process for Conversion of Cotton stalks into Bio-ethanol.	Dr. K. Pandiyan (PI) Dr. Ajinath Dukare	2025-27
CRP-TNAU -02	Bioprocessing of natural fibres and agro residues for production of oligo-saccharides and lignin-derived aromatics.	Dr A S M Raja (CCPI) Dr. K. Pandiyan	2022-26

Annexure II

PERSONNEL

(As on December 31, 2025)

DIRECTOR

Dr. S. K. Shukla

M. Tech., Ph.D. (Agricultural Structure and Process Engineering)

SCIENTIFIC STAFF HQ, MUMBAI

HEAD OF DIVISION

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Dr. Dattatreya M. Kadam, M. Tech, Ph.D
(Agricultural Structure and Process Engineering) Engineering Technology Transfer Division (ETTD) 2. Dr. N. Shanmugam, M. Tech., MIE, D.TT., Ph.D. (Textile Manufacture & Technology) Mechanical Processing Division (MPD) | <ol style="list-style-type: none"> 3. Dr. A. S. M. Raja, M. Sc., Ph.D.
(Textile Chemistry) Quality Evaluation and Improvement Division (QEID) 4. Dr. N. Vigneshwaran, M.Sc.(Agri.) M.B.A., Ph.D. (Agricultural Microbiology & Head In-Charge Chemical and Biochemical Processing Division (CBPD) |
|--|--|

PRINCIPAL SCIENTIST

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Dr. P. S. Deshmukh, M. Tech., Ph.D., LL.B., FIE. (Farm Machinery & Power) 2. Dr. C. Sundaramoorthy, M.Sc., Ph.D. (Agricultural Economics) | <ol style="list-style-type: none"> 3. Dr. A. K. Bharimalla, M. Tech., Ph.D. (Composite) 4. Dr. V.G. Arude, M. Tech. Ph. D. (Farm Machinery & Power) |
|---|---|

SENIOR SCIENTIST

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Dr. (Mrs.) Jyoti M. Nath, M.Sc., Ph.D. (Electronics & Instrumentation) (Resignation Submitted) 2. Dr. A. Arputharaj, M.Sc., M. Tech., Ph.D. (Textile Chemistry) 3. Dr. T. Senthilkumar, M. Tech., Ph.D. (Textile Manufacture) 4. Dr. G.T.V. Prabu, M.Tech., M.B.A., Ph.D (Textile Manufacture) 5. Dr. G. Krishnaprasad, M. Tech., Ph.D.(Textile Manufacture) | <ol style="list-style-type: none"> 6. Dr. P. Jagajanantha, M. Tech., Ph.D. (Textile Chemistry) 7. Dr. Kirti Ramesh Jalgaonkar, M.Sc. (PHT), Ph.D., (Agricultural Structures and Process Engineering) 8. Dr. Manoj Kumar Mahawar, M.Tech. Ph.D. (DPHT) (Agricultural Structures & Process Engineering) 9. Dr. Ajinath Sridhar Dukare, M.Sc., PhD (Agricultural Microbiology) |
|---|---|

SCIENTIST

1. Dr. Sheshrao Sakharam Kautkar, M.Sc. Ph.D.
(Agricultural Structures & Process Engineering)
2. Dr. (Smt.) Sharmila Patil, M.Sc. (P.H.T.),
Ph.D. (Agricultural Structures & Process Engineering)
3. Dr. Manoj Kumar, M.Sc., Ph.D.(Plant Biochemistry)
4. Dr. (Smt.) Jyoti Dhakane- Lad, M. Tech.,
Ph.D. (Agricultural Structures & Process Engineering)
5. Dr. Kanika Sharma, M.Sc., Ph.D,
(Plant Biochemistry)
6. Dr. Himanshushekhar Chaurasia, M.Sc.,
Ph.D. (Computer Application & IT)

GTC, NAGPUR**OFFICER-IN-CHARGE**

1. Dr. K. Pandiyan, Senior Scientist. M.Sc. Ph.D. (Agricultural Microbiology)

PRINCIPAL SCIENTIST

1. Dr. S.V. Ghadge, M.E. (Ag.) M.B.A., Ph.D.

SENIOR SCIENTIST

1. Dr. (Ms.) Varsha Satankar, M. Tech. Ph.D
(Agricultural Structures & Process Engineering)

SCIENTIST

1. Dr. Shekh Mukhtar Mansuri, M.Tech., Ph.D,
(Agricultural Structures & Process Engineering)
2. Dr. Sujan Adak, M.Sc. Ph.D,
(Agricultural Physics)

TECHNICAL STAFF**HQ, MUMBAI****CHIEF TECHNICAL OFFICER**

1. Dr. (Smt.) Sheela Raj, M.Sc., Ph.D.
2. Shri S. Banerjee, M.Sc.
3. Shri B.R. Pawar, M. Sc., LL.M.
4. Shri R.R. Chhagani, M.Sc.
5. Smt. P.S. Nirhali, M.Sc.
6. Shri Sharad V. Kokane, M.A.
7. Er. Chandrika Ram, M. Tech. (APFE)

ASSISTANT CHIEF TECHNICAL OFFICER

1. Shri R.S. Narkar, M.Sc., D.C.I.A.
2. Dr. (Ms.) C.P.D' Souza, M.Sc. Ph.D.
3. Smt. P. R. Mhatre, B.S.c, M.Lib.

SENIOR TECHNICAL OFFICER

- | | |
|--------------------------------|----------------------------------|
| 1. Smt. Binu Sunil, M.Sc. | 4. Dr. N. D. Kambli, M.Sc. Ph.D. |
| 2. Smt. Bindu Venugopal, M.Sc. | 5. Shri R.P. Kadam, M.Sc. |
| 3. Shri M.G. Ambare, M.Sc. | |

TECHNICAL OFFICER

- | | |
|---|------------------------------------|
| 1. Shri S. N. Patil, B.E. (Civil) | 4. Smt. M.P. Kamble, B.A., M. lib. |
| 2. Shri D. M. Correia, I.T.I., N.C.T.V.T.
(Mechanic) | 5. Shri A. R. Jadhav, M. Sc. |
| 3. Smt. H. R. Pednekar, M.A., M.Lib & I.Sc. | 6. Shri D.A. Salaskar, Driver |

SENIOR TECHNICAL ASSISTANT

- | | |
|-----------------------------------|--|
| 1. Shri Santosh V. Kokane, Driver | 2. Shri P.G. Gavhale, B.Sc. (Agri.), Dip. Agrl.
Sci., M.Sc. |
|-----------------------------------|--|

TECHNICAL ASSISTANT

- | | |
|-------------------------------------|----------------------|
| 1. Shri S.K. Parab, Cert. Cot. Spin | 3. Shri Mukesh Onkar |
| 2. Shri S.G. Phalke | |

SENIOR TECHNICIAN

1. Shri Yogesh Nagpure

TECHNICIAN

- | | |
|---------------------------|--------------------|
| 1. Kum. Nevali S. Pathare | 3. Shri V. Murugan |
| 2. Shri P.P. Patil | |

TECHNICAL TRAINEE

- | | |
|----------------------------------|----------------------|
| 1. Shri Sandeepkumar Yadav | 5. Shri Amar Verma |
| 2. Shri Vishal Malav | 6. Shri Bipin kumar |
| 3. Shri Rameshwar Jakhar | 7. Shri Rajesh Kumar |
| 4. Shri Ronal Tarachand Gajbhiye | |

GTC, NAGPUR

CHIEF TECHNICAL OFFICER

1. Er. D. U. Patil, M. Tech. (Agril. Engg.)
2. Shri S.N. Hedau, B.Sc.

TECHNICAL OFFICER

1. Shri Anil Kumar Kulsange, M.Sc.
2. Smt. Rohini T. Khobragade, M.C.A

SENIOR TECHNICAL ASSISTANT

1. Shri P.P. Thakur, B. Tech. (Agril. Engg.)

TECHNICAL TRAINEE

1. Shri Snehal Gajanan Lonare
2. Shri Abhishek Awasthi

QE UNIT, COIMBATORE

1. Shri M. Bhaskar, Dip. Ref. & Air-Cond.,
Senior Technical Officer
2. Shri Sahil Acharekar, Technician

QE UNIT, DHARWAD

1. Smt. V. G. Udikeri, M.Sc., Sr. Technical Officer

QE UNIT, GUNTUR

1. Shri Bhaskara Rao Vazragiri, Technical Assistant
2. Shri Soheli N. Shaikh, Technician
3. Shri Amit Kumar, Technical Trainee

QE, UNIT, SIRSA

1. Shri Sunil Kumar, Technical Assistant

QE, UNIT, SURAT

1. Shri D. J. Dhodiya, Senior Technician
2. Shri M. G. Sosa, Technician

**ADMINISTRATIVE STAFF
HQ, MUMBAI****SENIOR ADMINISTRATIVE OFFICER**

Shri Yogesh Pathare

FINANCE & ACCOUNTS OFFICER

Shri Sumit Saurabh

ADMINISTRATIVE OFFICER

Smt. Trupti Mokal

**ASSISTANT FINANCE &
ACCOUNTS OFFICER**

Shri Sainath N. Sahane

ASSISTANT

1. Shri T.D. Dhamange
2. Shri S. N. Bandre
3. Shri Siddhesh S. Divekar
4. Shri Mayank Chaurasia

LOWER DIVISION CLERK

1. Shri R.G. Matel
2. Shri D.K. Kasar
3. Shri S.M. Chandanshive
4. Shri Thapa Gorkha Bahadur Ovilal

PERSONAL ASSISTANT

1. Smt. R. R. Tawade
2. Smt. V. R. Naik

GTC, NAGPUR**ASSISTANT ADMINISTRATIVE OFFICER**

1. Smt. Shubhangi Prakash Kharche

PERSONAL ASSISTANT

2. Shri R. D. Shambharkar

**SKILLED SUPPORTING STAFF
HQ, MUMBAI**

1. Shri M. K. Prabhulkar
2. Shri J. D. Sakpal
3. Shri Sunil R. Tondse
4. Shri V. B. Poojari
5. Shri S.P. Naik
6. Shri M. N. Kamble
7. Shri Suhas R. Tondse
8. Shri S. S. Surkule
9. Smt. Kamla Murugan
10. Shri D. R. Gawade
11. Shri P.E. Gurav
12. Shri Mahesh C. Solanki

GTC, NAGPUR

1. Shri R. S. Umare
2. Smt. M. M. Bhandakkar

QE UNIT, COIMBATORE

1. Shri V. Subbaiah

NEW JOINING

Sr. No.	Name of Employee	Designation	Date of Joining
1.	Shri Rajesh Kumar	Technical Trainee	10.03.2025
2.	Dr. Sujan Adak	Scientist	12.07.2025
3.	Shri Mayank Chaurasia	Assistant	01.09.2025

ASSESSMENT PROMOTIONS/DEPARTMENTAL PROMOTIONS

Sr. No.	Name of Employee	Grade to which promoted	Effective Date of Promotion
1.	Dr. G.T.V. Prabu	Senior Scientist (Level-13A, RGP 9000)	15.09. 2024
2.	Dr. G. Krishnaprasad	Senior Scientist (Level-13A, RGP 9000)	15.09. 2024
3.	Dr. Ajinath Dukare	Senior Scientist (Level 12, RGP 8000)	01.07.2024
4.	Dr. Himanshushekhar Chaurasia	Scientist (Level 11, RGP 7000)	25.04.2024

SUPERANNUATION

Sr. No.	Name of Employee	Designation	Date of Superannuation/Retirement
1.	Shri Thiagarajan K	C.T.O	31.03.2025
2.	Dr. Sujata Rajesh Kawlekar	C.T.O	30.04.2025
3.	Smt. Smita Prakash Paiyala	A.A.O	30.04.2025
4.	Shri Sudam Dhondiba Magar	S.S.S	30.04.2025
5.	Shri Manohar Maruti Kadam	T.A	31.05.2025
6.	Dr. Sujata Saxena	P.S	30.06.2025
7.	Shri H. B. Vesmiya	S.S.S	30.06.2025
8.	Dr. Hamid Hasan	C.T.O	31.07.2025
9.	Shri Deepak Ganapat Gole	Technician	31.10.2025
10.	Shri R. S. Prabhudesai	C.T.O	30.11.2025
11.	Shri U. G. Devikar	C.T.O	30.11. 2025

TRANSFER

Sr. No.	Name of Employee	Designation	Transfer	W.E.F
1.	Dr. R. Pandiselvam	Scientist	ICAR-CIRCOT, Mumbai To ICAR-IARI, New Delhi	22.04.2025
2.	Shri Abhishek Awasthi	Technical Trainee	ICAR-CIRCOT, Mumbai To ICAR-CIRCOT, GTC, Nagpur	04.08.2025
3.	Shri Amit Kumar	Technical Trainee	ICAR-CIRCOT, GTC, Nagpur To Quality Evaluation of CIRCOT, Guntur	04.08.2025
3.	Shri R.G. Matel	LDC	ICAR-CIRCOT, GTC, Nagpur To ICAR-CIRCOT, Mumbai	03.03.2025
4.	Smt. Shubhangi Kharche	AAO	ICAR-CICR, Nagpur To ICAR-CIRCOT, GTC, Nagpur	07.04.2025
5.	Shri Ronal Tarachand Gajbhiye	Technical Trainee	ICAR-CIRCOT, GTC, Nagpur To ICAR-CIRCOT, Mumbai	04.08.2025
6.	Shri Umrao Meena	Senior Technician	ICAR-CIRCOT, Sirsa Unit To ICAR-CAZRI Jodhpur	23.10.2025

VOLUNTARY RETIREMENT

Sr. No.	Name of Employee	Designation	With effect from
1.	Shri S.B. Worlikar	S.S.S	31.07.2025

RESIGNATION

Sr. No.	Name of Employee	Designation	With effect from
1.	Shri Md. Adil	Assistant	19.08.2025

OBITUARY

1. Dr. P.G. Patil, Former Director expired on January 29, 2025
2. Shri. H.R. Laxmivenkatesh, Retired Assistant Chief Technical Officer, expired on October 30, 2025

Annexure III

LIST OF COMMITTEES

Institute Management Committee (IMC)

Dr. S. K. Shukla <i>Director, ICAR-CIRCOT</i>	Chairman	Dr. Gopal Agarwal <i>Prof. IIT, Delhi</i>	Member
Dr. A. K. Thakur, <i>ADG (PE), ICAR, New Delhi</i>	Member	Dr. S. P. Borkar <i>Professor, VJTI, Mumbai</i>	Member
Dr. D. P. Ray, <i>PS, ICAR-NINFET, Kolkata</i>	Member	Dr. R. V. Adivarekar, <i>ICT, Mumbai</i>	Member
Dr. Vinita Gotmare <i>PS, ICAR-CICR, Nagpur</i>	Member	Dr. K. Narsaiah <i>ADG (PE), ICAR, New Delhi</i>	Member
Dr. R. K. Vishwakarma <i>PS, ICAR- CIPHET, Ludhiana</i>	Member	Mr. Makarand Korde	Member
Dr. Blaise De'Souza <i>PS, ICAR-CICR, Nagpur</i>	Member	Mr. Sachin Kulkarni	Member
Dr. Sharad Gadakh, <i>DoR, MPKV, Rahuri</i>	Member	Dr. S. K. Shukla <i>Director, ICAR-CIRCOT</i>	Member
Shri M. M. Korde,	Member	Dr. V.G. Arude, <i>Principal Scientist</i>	Member-Secretary
Shri Sachin Kulkarni	Member	Institute Technology Management Committee	
Director of Agriculture, <i>Govt. of Maharashtra</i>	Member	Dr. S. K. Shukla <i>Director, ICAR-CIRCOT</i>	Chairman
Director of Agriculture, <i>Govt. of Karnataka</i>	Member	Dr. Sujata Saxena <i>Principal Scientist & Head, CBPD (Since retired June 2025)</i>	Member
Shri R.K. Singh, <i>Comptroller ICAR-CIFE, Mumbai</i>	Member	Dr. D.M. Kadam <i>Principal Scientist & Head, ETTD</i>	Member
Shri Yogesh Pathare, <i>Sr. Administrative Officer</i>	Member-Secretary	Dr. N. Shanmugam <i>Principal Scientist & Head, MPD</i>	Member
		Dr. A. S. M. Raja <i>Principal Scientist, & Head QEID</i>	Member

Research Advisory Committee (RAC)**W.e.f^{5th} March 2023**

Dr. S. M. Ilyas <i>Former Director, NAARM, Hyderabad</i>	Chairman	Dr. N. Vigneshwaran <i>Principal Scientist & Head (Incharge) CBPD</i>	Member
Dr. S. Sreenivasan <i>(since deceased in November 2024) Former Director, ICAR-CIRCOT</i>	Member	Dr. C. Sundaramoorthy <i>Principal Scientist, & I/c PME</i>	Member
Dr. Pitam Chandra <i>Former ADG (PE), ICAR, New Delhi</i>	Member	Dr. Swadesh Prakash <i>Principal Scientist, CIFE, Mumbai</i>	External Member

Dr. K. Pandiyan Member
Senior Scientist, Officer I/c, GTC, Nagpur

Dr. A.K. Bharimalla Member-Secretary
Principal Scientist, ETTD & Principal Investigator,
ICAR-CIRCOT-ABI Centre

Institute Joint Staff Council Official Side

Dr. S.K. Shukla, Director Chairman

Dr. N. Shanmugam, Member
Principal Scientist & Head MPD

Shri Yogesh R. Pathare, SAO Member

Shri Sumit Saurabh, FAO Member

Shri R.R. Chhagani, Member
Chief Technical Officer

Shri Anand Jadhav, Member-Secretary
Technical Officer

Staff Side

Shri M.K. Prabhulkar IJSC
Skilled Supporting Staff Member-Secretary

Shri Sudhakar Chandanshive CJSC Member
Lower Division Clerk

Shri Surendra K. Parab Member
Technical Assistant

Shri Prakash Gurav Member
Skill Supporting Staff

Internal Complaints Committee

Dr. (Smt.) Kirti Jalgaonkar, Chairman
Senior Scientist

Dr.(Smt.) Pratima Goyal, External-Member
Head Department of Textile &
Fashion Technology at College of Home Science,
Nirmala Niketan, Mumbai

Dr. T. Senthilkumar, Member
Senior Scientist

Smt. Trupti Mokal, Member
Administrative Officer

Dr. C.P.D. Souza, Member-Secretary
Asst. Chief Technical Officer

ABI Advisory Committee

Dr. S. K. Shukla Chairman
Director, ICAR-CIRCOT

Dr. R. P. Kachru Member
Former ADG (PE), ICAR, New Delhi

Dr. A. J. Shaikh Member
Former Director, ICAR-CIRCOT, Mumbai

Prof. Narendra G. Shah Member
CTARA, IIT, Mumbai

Dr. M. K. Sharma Member
Whole Time Director & CEO, BSIL

Dr. A. K. Bharimalla, Member-Secretary
Principal Scientist, ETTD
PI: ICAR-CIRCOT-ABI centre
(ICAR-CIRCOT-ABIC)

RAFTAAR-Incubation Committee (RIC) of CIRCOT RABI

Dr. S. K. Shukla, Director Chairman

Prof. (Dr.) S. S. Dolli Member
Prof. & Head Dept. of Agril. Extension, UAC,
Dharwad and PI & CEO of KRISHIK ABI, UAS,
Dharwad

Dr. G. R. Anap Member
Former International Cotton Consultant,
World Bank Project (Africa)

Shri Abasaheb K. Haral Member
Rtd. Joint Director Agriculture and chief
coordinator (PPP-IAD), Dept. of Agriculture,
Govt. of Maharashtra

Prof. (Dr.) V. D. Gotmare, Member
(Retd.) Associate Professor and Head,
Department of Textile Manufactures,
VJTI, Mumbai

Mr. Vasant U. Mhaske Member
Retired General Manager, Bank of Maharashtra

Dr. Ashok K. Bharimalla, Member Secretary
Principal Scientist, ETTD ICAR-CIRCOT,
Mumbai & PI & CEO, CIRCOT-R-ABI

QRT Committee

Dr. K. K. Singh	Chairman
<i>Vice Chancellor, SVP University of Agriculture and Technology, Modipuram, Meerut</i>	
Dr. G. S. Nadiger	Member
<i>Research Advisor, SASMIRA</i>	
Dr. A. J. Shaikh	Member
<i>Former Director, ICAR-CIRCOT</i>	
Dr. Kanchan K. Singh	Member
<i>Dean, School of Agriculture Sanskriti University, Mathura</i>	
Dr. S. Patel	Member
<i>Professor & Former Head, AP&EF, IGKV, Raipur</i>	
Mr. Prashant Kumar Mohota	Member
<i>Managing Director (MD), Gimatex Industries Pvt. Ltd, Wardha</i>	
Dr. A. S. M. Raja	Member-Secretary
<i>PS & Head, QEID, ICAR-CIRCOT</i>	

The Institute Biosafety Committee (IBSC) of ICAR-CIRCOT

Dr. N. Vigneshwaran	Chairman
<i>Principal Scientist & Head (Incharge) CBPD</i>	
Dr. Shamlan M.S. Reshamwala	DBT Nominee
<i>Assistant professor at ICT Mumbai</i>	
Dr. Aparna Choudhary	Outside Expert
<i>Principal scientist at ICAR-CIFE, Mumbai</i>	
Dr. Rakesh Waghmare	Biosafety Officer
<i>Associate Professor at Sir JJ group of Hospital, Mumbai</i>	

Dr. AjinathDukare	Member of IBSC
<i>Senior Scientist CBPD</i>	
Dr. K. Pandiyan	Member of IBSC
<i>Senior Scientist and In charge GTC, Nagpur</i>	
Dr. Kanika Sharma	Member of IBSC
<i>Scientist CBPD</i>	
Dr. Manoj Kumar	Member Secretary
<i>Scientist CBPD</i>	

Janjatiya Gaurav Varsh Pakhwada 2025

Dr. A. K. Bharimalla	Chairman
<i>Principal Scientist</i>	
Dr. T. Senthilkumar	Member
<i>Senior Scientist</i>	
Dr. Manoj Kumar Mahawar	Member
<i>Senior Scientist</i>	
Dr. S.S. Kautkar	Member
<i>Scientist</i>	
Dr. Kanika Sharma	Member Secretary
<i>Scientist</i>	
Shri S. Banerjee	Member
<i>CTO</i>	
Shri S. V. Kokane	Member
<i>CTO</i>	
Shri Manoj Ambare	Member
<i>STO</i>	

CITIZEN'S/CLIENT'S CHARTER

ICAR – Central Institute for Research on Cotton Technology

Adenwala Road, Matunga, Mumbai – 400 019

Phone: (022) 2414 6002

Website: <https://circot.icar.gov.in>

VISION

Global Excellence in Cotton Technology

To provide scientific and managerial interventions to post-harvest processing and value addition to cotton and utilization of its by-products to maximize economic, environmental and societal benefits.

MAIN SERVICES/TRANSACTIONS

Sr. No.	Services/Transactions	Responsible Persons
1.	Commercial Testing: Fibre, Yarn, Fabric, Garment, Spinnability, Non -Lint Content, Linter, Seed, Paper, Board, Absorbent cotton, Chemical and Biochemical Tests of Textile Materials, ECO, SEM, XRD, etc.	Dr. A. Arputharaj, Senior Scientist In-charge, Test House Email: cottontest@rediffmail.com
2.	Imparting Training to Stakeholders	Dr. A. K. Bharimalla, Principal Scientist Engineering Technology Transfer Division Email: ashokbhari72@gmail.com Dr. K. Pandiyan, Senior Scientist OIC, GTC, Nagpur Email: circot.nagpur@gmail.com
3.	Supply of Calibration Cotton	Dr. A.S.M. Raja, Principal Scientist & Head Quality Evaluation and Improvement Division Email: asmrja164751@gmail.com
4.	Agribusiness Incubation & Consultancy	Dr. A. K. Bharimalla, Principal Scientist In-Charge ITMU & PI, ABI Centre Email: abicircot@gmail.com
5.	Technology Transfer	Dr. D. M. Kadam, Principal Scientist & Head Engineering Technology Transfer Division Email: dmkadam11k@gmail.com

Public Grievance Officer

Senior Administrative officer E-mail: hoa.circot@icar.org.in

For Further Information, Contact

Dr. S.K. Shukla, Director, ICAR-CIRCOT, Mumbai

Email: director-circot@icar.org.in



सूचना का
अधिकार
RIGHT TO
INFORMATION

हमारा उद्देश्य OUR MOTIVE

पारदर्शिता को बढ़ावा देने के लिए
To Promote Transparency

जवाबदेही को बढ़ावा देने के लिए
To Promote Accountability

सूचना का अधिकार अधिनियम, की घोषणा के अनुसरण में निम्नलिखित अधिकारियों को इस संस्थान में जनसूचना अधिकारी, सहायक जनसूचना अधिकारी और अपीलीय प्राधिकारी के रूप में नामित किया गया है।

In Pursuance of the promulgation of Right to Information Act, 2005, the following Officers are designed as CPIO, Assistant CPIO and Appellate Authority at this Institute.

केन्द्रीय लोक सूचना अधिकारी Central Public Information Officer वरिष्ठ प्रशासनिक अधिकारी, भा. कृ. अनु. प. - के. क. प्रौ. अनु. सं. E-mail: hoa.circot@icar.org.in Tel: 022-24146002 Ext-126	अपीलीय प्राधिकारी Appellate Authority डॉ. एस. के. शुक्ला निदेशक, भा. कृ. अनु. प. - के. क. प्रौ. अनु. सं. E-mail: director-circot@icar.org.in director.circot1@gmail.com Tel: 022-2414 6002 Ext-133
सहायक केन्द्रीय लोक सूचना अधिकारी Assistant Central Public Information Officer प्रशासनिक अधिकारी, भा. कृ. अनु. प. - के. क. प्रौ. अनु. सं. E-mail: circotadmn1@gmail.com Tel: 022-24146002 Ext-140	

अधिक जानकारी के लिए <https://circot.icar.gov.in> पर लॉग ऑन करें।

आदेशानुसार



हर कदम, हर डभर
किसानों का हम्सफर
भारतीय कृषि अनुसंधान परिषद
Agrisearch with a human touch



एक कदम स्वच्छता की ओर