वार्षिक प्रतिवेदन

ANNUAL REPORT

2024

भाकृअनुप - केन्द्रीय पटसन एवं समवर्गीय रेशा अनुसंधान संस्थान
बैरकपुर, कोलकाता-700121
ICAR - Central Research Institute for Jute and Allied Fibres
Barrackpore, Kolkata-700121

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ISO 9001 : 2015

ISSN: 0973-0044

Citation:
Annual Report, ICAR-CRIJAF (2024). ICAR- Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata. P. 156

Front Cover Legend
Science of bast fibre crop of Jute, Sunnhemp, Rossel, Flax, Ramie and Sisal

Back Cover Legend
Fibres quality and bast fibre plants

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Photography: Scientists and Library Unit of ICAR-CRIJAF (K.K. Banik)

Printed by:
Mandal Press
Morning Star College, Barrackpore, Kolkata - 700121

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Mandate

- Basic and strategic research on improvement of jute and allied fibre crops for biotic and abiotic stresses, yield and quality.
- Development of economically viable and sustainable production technology, cropping systems and post-harvest technology.
- Co-ordination and monitoring of applied research on national and regional issues to develop improved varieties and technologies.
- Dissemination of technologies and capacity building.

Preface

The Central Research Institute for Jute and Allied Fibres (CRIJAF) is a unique and only institute under the aegis of NARS spearheading R&D on jute and allied fibre crops since pre-independence. Jute and allied fibre (JAF) crops provide eco-friendly, renewable, and biodegradable materials suitable for a wide range of applications. As the world moves towards a greener future, jute is poised to become a key determinant in creating a sustainable environment, with its biodegradable fibres and increasing export demand driving its commercial value to new heights. ICAR-CRIJAF has made significant research advancements in the areas of crop improvement, production, and protection for jute and allied fibre crops. During 2024, institute has released and notified several new varieties of jute and allied fibre crops that show great promise for farmers. Four varieties in particular - JRCP 7 of white (capsularis) jute, JROP 4 and JROV 5 of tossa (olitorius) jute and JBMP 6 of kenaf (HC mesta) were highlighted in an official announcement in the Gazette of India. These newly developed varieties boost higher yields and better fibre quality compared to existing cultivars. In addition to those four, one new variety each of white jute (JRC 9) and tossa jute (NJ 7068) were also released to provide more options to jute growers. Furthermore, another promising new variety of kenaf, AMV-11, was identified and recommended for central release. The development and release of these enhanced jute and allied fibre crop varieties by CRIJAF will give farmers access to higher-yielding, premium quality options to cultivate.

Under crop improvement, CRISPR/Cas genome editing techniques are being explored to enhance jute fibre properties and agronomic traits. Researchers identified valuable genetic resources like jute-specific ILP markers, RGAs, and promising interspecific crosses for breeding programs. In crop production, long-term studies demonstrated the effectiveness of integrated nutrient and water management practices for optimizing crop yields, soil quality, and resource-use efficiency in jute-based cropping systems. Jute's role as an effective carbon sink and its potential for bioethanol production to reduce GHG emissions was highlighted. The Jute-ICARE project successfully reached a large number of farmers, bridging yield gaps using CRIJAF technologies. Several efficient machines were developed to mechanize jute production. Under crop protection, germplasm lines with stem rot resistance were identified. Effective pest management strategies using biopesticides, acaricides, insecticides, fungicides, and IPM approaches were developed to control major jute pests. Predictive models based on weather parameters were also developed for forecasting pest populations. Overall, CRIJAF's research efforts have significantly contributed to the improvement of jute and allied fibre crops, benefiting farmers and the industry.

The ICAR-CRIJAF has been actively working to promote jute cultivation and support farmers in major jute-growing districts of India. Through frontline demonstrations of high-yielding jute varieties and improved production methods, average yields increased by 12-18%. The institute also undertook programs under the Scheduled Caste Sub-Plan and Scheduled Tribe initiatives, training and supporting over 18,000 SC farmers

and 1,720 ST farmers with seeds, fertilizers, equipment and more. Recognizing the unique challenges faced by women farmers, ICAR-CRIJAF implemented programs to introduce women-friendly tools, build their skills and entrepreneurial abilities, and foster the creation of Self Help Groups. These efforts have made a substantial impact in empowering rural women and developing the jute industry in West Bengal.

The coordinated efforts of scientists, extension specialists, and farmers at ICAR-CRIJAF have had a significant positive impact on the jute and allied fibre sector. Through targeted outreach programs, the institute has successfully disseminated its cutting-edge technologies to key stakeholders. The adoption of these CRIJAF-developed solutions has led to measurable improvements in crop productivity, fibre quality, and financial returns for farmers in beneficiary areas. This success has been recognized and supported by important policy-making bodies like the National Jute Board, Jute Corporation of India, and State Agriculture Departments. ICAR-CRIJAF also regularly conducts capacity building initiatives for Self Help Groups focused on jute-based handicrafts and value-added products to boost off-farm incomes. Over the past year, the institute's scientists have actively participated in international and national webinars, seminars, conferences and other professional development programs to share their expertise. ICAR-CRIJAF's cutting-edge research has also been extensively published in top-tier peer-reviewed journals. In recognition of its academic excellence, ICAR-CRIJAF has offered 25 seats for UG, 11 seats for PG and 5 seats for PhD under IARI-Kolkata hub.

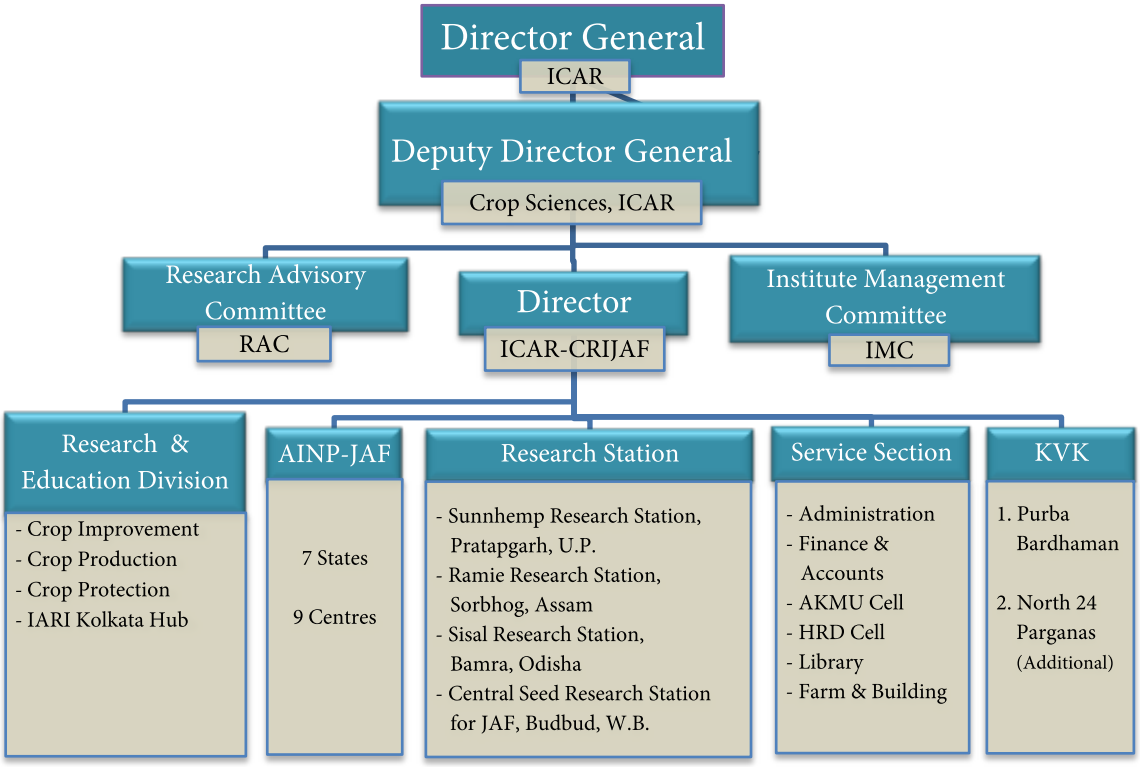
The support and trust of our stakeholders and farmers have been instrumental in enabling us to pursue our mission with dedication and conviction. We are deeply grateful for their belief in our work. I would like to extend my heartfelt appreciation to Dr. Himanshu Pathak, Secretary of DARE, Government of India, and Director General of ICAR, for his dynamic leadership and invaluable guidance. His vision has been a driving force behind our efforts. I also express my sincere gratitude to Dr. T. R. Sharma, Deputy Director General (Crop Science), Dr. D. K. Yadava, Assistant Director General (Seeds), and Dr. Prasanta Kumar Dash, Assistant Director General (Commercial Crops), ICAR, New Delhi, for their constant encouragement and support, which have been vital to our success. The Chairman of RAC and his team also deserve special recognition for their steadfast backing and motivation. Finally I appreciate the editorial team and other contributors for their hard work to publish this report in a timely manner.

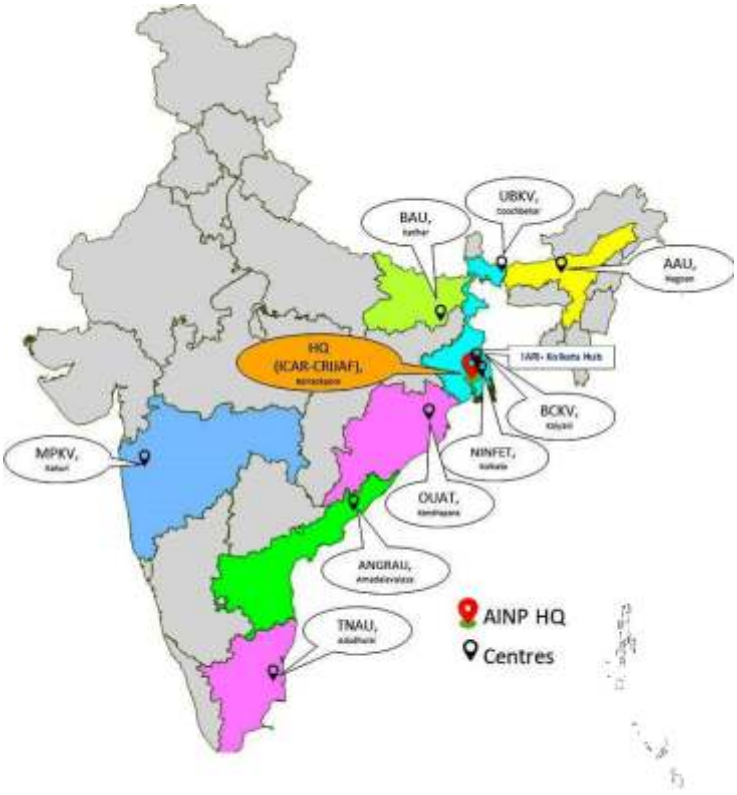
Place: Barrackpore
Date: 06-03-2025

(Gouranga Kar)
Director, ICAR-CRIJAF

Vision & Mission

ORGANOGRAM OF ICAR-CRIJAF





विशिष्ट सारांश

भाकृअनुप-क्रिजैफ (ICAR-CRIJAF) को भारत में पटसन एवं समवर्गीय रेशा फसलों के उत्पादन, उत्पादकता और स्थिरता को बढ़ाने के उद्देश्य से बुनियादी, रणनीतिक और व्यावहारिक अनुसंधान करने की ज़िम्मेदारी है। संस्थान के अनुसंधान कार्यक्रम तीन प्रमुख विषय क्षेत्रों पर किया जाता है:- फसल सुधार, फसल उत्पादन और फसल संरक्षण। नई विकसित प्रौद्योगिकियों को पटसन एवं समवर्गीय रेशा पर अखिल भारतीय नेटवर्क परियोजना (एआईएनपी-जेएएफ) द्वारा अनुशंसित करने के पश्चात विस्तार और संवर्धन कार्यक्रमों के माध्यम से किसानों और हितधारकों के बीच बढ़ाया जाता है। वर्ष 2024 के दौरान, संस्थान ने अनुसंधान में महत्वपूर्ण उपलब्धियां हासिल कीं और विभिन्न कार्यक्रमों के माध्यम से पटसन और संबद्ध रेशा उगाने वाले किसानों को प्रौद्योगिकियों का प्रदर्शन किया। वर्ष 2024 में भाकृअनुप-क्रिजैफ के पास 17 इन-हाउस प्रोजेक्ट और 23 बाहरी संस्था से वित्त पोषित परियोजनाएं चल रही थीं। वार्षिक प्रतिवेदन का कार्यकारी सारांश नीचे प्रस्तुत किया गया है।

फसल सुधार

जैव प्रौद्योगिकी अंत:क्षेप

- CRISPR/Cas वेक्टर का टोसा पटसन कोरकोरस ओलिटोरियस) और फ्लैक्स (लाइनम यूसिटाटिसिमम) में जीनोम संपादन के लिए उपयोग करने के लिए pRGEB31 का संशोधन किया गया। इसके साथ ही दोनों सिरों पर HindIII और SbfI प्रतिबंध स्थलों से घिरे सिंथेटिक डीएनए ओलिगोन्यूक्लियोटाइड (pAtU6-gRNA स्कैफोल्ड) को डिजाइन किया गया। जबकि तीन लक्षणों को जीनोम संपादन के लिए लक्षित किया गया, जिनमें फाइबर गुणवत्ता सुधार, खरपतवार रोधी प्रतिरोध का सुधार और पटसन में प्रारंभिक पुष्पन की रोकथाम शामिल हैं। इसके अलावा 12 जीनों के लिए गाइड आरएनए डिजाइन किए गए।
- फ्लैक्स किस्म JRF 2 को सिल्वर नैनोपार्टिकल्स उपयोग करके पुनर्जनन किया गया। पटसन किस्म JRO 524 (कोरकोरसओलिटोरियस) और JRC 212 (कोरकोरस कैप्सुलेरिस) के लिए इन-विट्रो शूट पुनर्जनन प्रणाली विकसित की गई। इसदौरान JRO 524, हायपोकोटाइल एक्सप्लांट्स ने उल्लेखनीय पुनर्जनन क्षमता प्रदर्शित की, जिसमें कॉलस बन रहा था और SM3 और SM माध्यम पर शूट पुनर्जनित हो रहे थे। जबकि JRC 212 में, हायपोकोटाइल और कोटिलेडोनरी पत्तियाँ ASRM माध्यम पर महत्वपूर्ण स्वेलिंग और उभार दिखा रही थीं।
- 99 पटसन-विशिष्ट इंट्रॉन लिंक्ड पोलिमॉर्फिक (ILP) मार्करों में से 30 मार्कर WCIN 183A और OIN456 पेरेंट्स के बीच पोलिमॉर्फिक पाए गए। पटसन जीनोम से 170 प्रतिरोध जीन एनालॉग्स (RGAs) जिसमें NBARC डोमेन शामिल थे,की पहचान की गई।
- कापोली (कोरकोरस कैप्सुलेरिस × कोरकोरसओलिटोरियस) पटसन ने अपने संस्थापक पौधों की तुलना में 62% और 74% तक अद्वितीय उपज सुधार दिखाया। फाइबर उपज और तना-बेस व्यास पर जीनोटाइपिक प्रभाव वर्षों के दौरान स्थिर रहे। कापोली पटसन में बास्ट फाइबर उपज में सुधार उच्च फाइबर सामग्री के कारण नहीं था, क्योंकि कोरकोरस ओलिटोरियस और कापोली के बीच फाइबर सामग्री में कोई अंतर नहीं था। कापोलीपटसन में अधिक संकुचित और घना FCBs पाया गया।
- 66, 47, और 72 जंगली प्रकार के (Col-0) एरेबिडॉप्सिस पौधों को फ्लैक्स हीट शॉक प्रोटीन (LuHSFA2a, LuHSFA2b, और LuNAC003) युक्त तीन संरचनाओं के साथ रूपांतरित किया गया, जिनमें से क्रमशः 9, 29 और 5 कैली का सफलतापूर्वक चयन किया गया और एक हरे ऑर्गेनोजेनिक कैली द्रव्यमान का उत्पादन किया गया।
- 38 MITE इन्सर्शन पोलिमॉर्फिज्म मार्कर को सुदृढ़ किया गया और 16 मार्कर 28 पटसन जर्मप्लाज्म में पोलिमॉर्फिक पाए गए। 32 SSR मार्करों और 5 ISSR मार्करों में से 4 SSR और 5 ISSR मार्करों ने कुल 37 बैंड्स/एललील उत्पन्न किए।
- भौतिक पूर्व उपचार के रूप में भाप, रासायनिक पूर्व उपचार के रूप में अम्ल और क्षार, इसके बाद एंजाइमेटिक उपचार के माध्यम से केनाफ बायोमास का 75% से अधिक डिलिग्नीफिकेशन प्राप्त किया गया। ट्राइकोडर्मा रेसई में इन-सीटू सेलुलोलिटिक एंजाइम उत्पादन के लिए एक हरित प्रौद्योगिकी विकसित की गई। पटसन

का सैकरिफिकेशन माइक्रोबियल कल्चर का उपयोग करके किया गया, जिससे प्रति ग्राम सूखी बायोमास में 500 मिलीग्राम से अधिक रिड्यूसिंग शुगर का उत्पादन हुआ।

फाइबर उपज और गुणवत्ता के लिए प्रजनन

- JROBA-3 × OIJ-161 (26.00 ग्राम/पौधा), JROBA-3 × WCIN-136-1 (20.00 ग्राम/पौधा), JROBA-3 × WCIN-179 (19.75 ग्राम/पौधा), JRO-204 × WCIN-136-1 (11.78 ग्राम/पौधा), और JRO-204 × WCIN-179 (5.21 ग्राम/पौधा) को फाइबर उपज के लिए सर्वश्रेष्ठ हेटेरोटिक संयोजन के रूप में देखा गया, जिससे इन्हें पटसन उत्पादन में सुधार के लिए संभावनाशील उम्मीदवार के रूप में पहचाना गया।
- 100 जर्मप्लाज्म में से 12 ने चेक किस्म के मुकाबले माइट हमले के स्तर में महत्वपूर्ण कमी दिखाई। OIN-082 (21.33 माइट्स/सेंटीमीटर^2), OEX-013 (24.66 माइट्स/सेंटीमीटर^2), OEX-32 (30.00 माइट्स/सेंटीमीटर^2), OEX-07 (40.00 माइट्स/सेंटीमीटर^2) और OIJ-98 (43.84 माइट्स/सेंटीमीटर^2) ने दो लगातार मौसमों में स्थिर सहनशीलता दिखाई। 70 टोसा पटसन और 10 सफेद पटसन जर्मप्लाज्म में से पांच ने तना सड़न (stem rot) के प्रति सहनशीलता प्रदर्शित की।
- 92 जीनोटाइप्स की स्क्रीनिंग में OIN-0945 ने सबसे अधिक हरा वजन (555 ग्राम) रिकॉर्ड किया, OIN-1159 ने सबसे अधिक सूखा फाइबर वजन (44.4 ग्राम), OIJ-040 ने उत्कृष्ट पौध ऊंचाई (440 सेंटीमीटर) प्रदर्शित की और OIJ-280 ने उच्चतम आधार व्यास (2.28 सेंटीमीटर) दिखाया। ऊंचे पौधे, अधिक नोड गिनती और बड़ा आधार व्यास फाइबर उपज में सकारात्मक योगदान करते हैं। 150 F_4 पीढ़ियों में से, कई रोचक लक्षण जैसे तना सड़न प्रतिरोध, शाखा रहित और पुष्पन रहित लक्षण देखे गए। 45 सफेद पटसन (कोरकोरस कैप्सुलेरिसल.) की F4 लाइनों में से शीर्ष 5 लाइनों (F4-38, F4-35, F4-1, F4-9, और F4-37) को फाइबर उपज और कृषि लक्षणों के लिए श्रेष्ठ के रूप में पहचाना गया।
- टोसा पटसन के लिए 50% घातक खुराक (LD50) मान 4 घंटे तक EMS उपचारित 1% सांद्रता पर स्थापित किया गया। M0 उत्परिवर्तन जनसंख्या से प्राप्त 5000 पौधों को M1 पीढ़ी के तहत प्रजनन पंक्तियों में उगाया गया। 891 M0 पौधों के बीजों की समान मात्रा को एकत्र करके 50,000 M1 पौधों का विकास किया गया।
- नई जलवायु स्मार्ट सफेद पटसन किस्म JRC 9 (नमिता) जिसमें उच्च रोग-कीट और जलभराव सहनशीलता, उच्च फाइबर उपज और उत्कृष्ट फाइबर थे, को माननीय प्रधानमंत्री द्वारा 11.08.2024 को 100 जलवायु स्मार्ट फसल किस्मों में से एक के रूप में औपचारिक रूप से जारी किया गया और यह राजपत्र अधिसूचना संख्या एस.ओ. 4388(ई) 08.10.2024 के माध्यम से अधिसूचित किया गया। JRC 9 ने किस्म मूल्यांकन के दौरान विभिन्न स्थानों पर औसत उत्पादकता 32 क्यू/हेक्टर प्रदर्शित की। विशेष स्थानों पर इसने 43.7 क्यू/हेक्टर की उपज प्राप्त की, जो टोसा पटसन उपज के समान है।
- पटसन और संबद्ध रेशा फसलों की चार किस्में, कैप्सुलरिस जूट की जेआरसीपी 7, ओलिटोरियस पटसन की जेआरओपी 4 और जेआरओवी 5 तथा एचसी मेस्टा की जेबीएमपी 6 को भारत के राजपत्र में जारी और अधिसूचित किया गया है। इसके अलावा, सफेद पटसन (जेआरसी 9) और टोसा पटसन (एनजे 7068) की एक- एक किस्म भी जारी की गई है। एआईएनपीजेएएफ की 35 वीं वार्षिक कार्यशाला के दौरान केंद्रीय रिलीज के लिए एचएस मेस्टा (एएमवी-11) की एक किस्म की पहचान की गई है।
- 60 दिन की कटाई के बाद, जीनोटाइप OIJ-173 और OIJ-12 ने अध्ययन के तहत सबसे कम रेटिंग अवधि (5 दिन) प्रदर्शित की। 105 दिन पर, OIJ-173 ने सबसे कम रेटिंग अवधि (9 दिन) दिखाई। 120 दिन की कटाई के बाद, टोसा पटसन जीनोटाइप SS-02 ने सबसे कम रेटिंगलंबाई (11 दिन) प्रदर्शित की।

आनुवांशिक संसाधन और फसल सुधार

- आईसीएआर-क्रिजैफ, बैरकपुर में मीडियम-टर्म भंडारण सुविधा में पटसन एवं समवर्गीय रेशा फसलों के 5950 जर्मप्लाज्म की देखरेख की जाती है। कुल 371 पटसन एवं समवर्गीय रेशा जर्मप्लाज्म लाइनों को आईसीएआर-क्रिजैफ के वैज्ञानिकों, अखिल भारतीय पटसन एवं समवर्गीय रेशा नेटवर्क परियोजना और अन्य संस्थाओं सहित इंटेंडरों को वितरित किया गया। कुल 951 पटसन और संबंधित फाइबर जर्मप्लाज्म लाइनों को पुनर्जनन किया गया। वर्तमान रबी सीजन 2024-25 में कुल छह लाइनों का स्टेशन परीक्षण में JRF-2 के चेक के साथ मूल्यांकन किया जा रहा है। कुल 357 जर्मप्लाज्म लाइनों में 90 विदेशी एक्सेसन भी शामिल हैं, जो अनुरक्षणप्रजनन में हैं।
- 150 टोसा पटसन में से सात लाइनों ने प्रारंभिक पुष्पन के प्रति सहनशीलता दिखाई, जिनमें से पांच प्रतिशत से कम पौधों में फरवरी 15 की बुआई में प्रारंभिक पुष्पन का संकेत था। वही 1 मार्च 2024 को बुआई करने पर पटसन में लाइनों कोई पुष्प नहीं दिखा। सी. ट्राइडेन्स और सी. एस्टुआन्स से 2-2 जीनोटाइप्स को सेमीलूपर के प्रति अत्यधिक सहनशील पाया गया, जबकि सी. छद्म-ओलिटोरियससे 1 जीनोटाइप को पटसन संवेदनशील पाया गया।

- दो अलग-अलग कोर कलेक्शन विकसित किए गए, एक M-रणनीति का उपयोग करके 76 एक्सेसन (4.15%) और दूसरा यादृच्छिक खोज एल्गोरिथ्म के माध्यम से 92 एक्सेसन (5.02%)। 45 एक्सेसन दोनों सेटों में सामान्य थे। कोर कलेक्शन और पूरे कलेक्शन के बीच संयोग दर 96.16% निर्धारित की गई।
- 21 एक्सेसन ने फाइबर की महीनता में सबसे अच्छी चेक किस्म JRO 2407 से बेहतर प्रदर्शन किया, लेकिन कोई जर्मप्लाज्म सर्वोत्तम चेक किस्मों JRO 2407 और JRO 204 से अधिक उपज नहीं रिकॉर्ड कर सका। फाइबर गुणवत्ता को बढ़ाने के लिए चार लाइनों को सात टेस्टर्स के साथ क्रॉस किया गया।
- कोरकोरस की दो प्रजातियों कोरकोरस ओलिटोरियस (23JU05T, 23JU06T, 23JU07T, 23JU08T, 23JU09T और 23JU10T) और कोरकोरस कैप्सुलेरिस (23JU01T, 23JU02T, 23JU03T और 23JU04T) की दस किस्मों का DUS परीक्षण 2023-24 के दौरान किया गया। एक सफेद पटसन किस्म JRCJ 11 को DUS परीक्षण के बाद संरक्षण के लिए पंजीकरण कराया गया (प्रमाणपत्र की तारीख- 17.10.2024)। दो किस्मों JROP 4 और JRCP 7 के पंजीकरण के लिए आवेदन पी.पी.वी.एफ.आर. प्राधिकरण को भेजे गए हैं और वर्तमान में 2024-25 के दौरान DUS परीक्षण में हैं।
- दिनांक18.12.2023 को आयोजित टास्कफोर्स समिति बैठक में ड्राफ्ट DUS परीक्षण दिशानिर्देश प्रस्तुत किए गए। सभी सुझावों को शामिल करते हुए DUS परीक्षण दिशानिर्देश को अंतिम रूप दिया गया और 25.01.2024 को पंजीकरण के लिए पी.पी.वी.एफ.आर. प्राधिकरणको प्रस्तुत किया गया। इसके साथ हीसभी किस्मों/लाइनों के बीजों की बुवाई की गई।
- खरीफ 2023 के दौरानकुल 9.57 क्विंटल पटसन प्रजनक बीज और 7.0 क्विंटल सन्नहेम्प बीज का उत्पादित किया गया, जबकि DAC के 2024-25 के आदेश के अनुसार यह क्रमशः 4.97 क्विंटल और 0.90 क्विंटल था। रबी 2023 के दौरान फ्लैक्स किस्म JRF-2 के 3.5 क्विंटल प्रजनक बीज का भी उत्पादित किया गया । सभी इंटेंडेड पटसन किस्मों के प्रजनक बीजों की आनुवांशिक शुद्धता जांचने के लिए ग्रोआउट परीक्षण (GOT) किया गया। पटसन की जारी की गई किस्मों का कुल 229.6 किलोग्राम न्यूक्लियस बीज उत्पादित किए गए। 2024 में लगभग 725.41 क्विंटल टी एल बीज उत्पादित किया गया।

फसल उत्पादन

मिट्टी और जल उत्पादकता

- अन्य ट्रीटमेंटस (उपचारों) की तुलना में CRIJAF पर दीर्घकालिक उर्वरक प्रयोग के अंतर्गत 100% NPK+FYM उपचार द्वारा अधिकतम जैविक कार्बन सामग्री (0.90%) की प्राप्ति हुई जो मृदा उर्वरता को सार्थक रूप से बढ़ाता है। एकीकृत पोषण प्रबंधन से मिट्टी में सूक्ष्मजीव गतिविधि में वृद्धि हुई। ऐसा एंजाइम गतिविधियों जैसे FDA, DHA, फास्फेटेज और मृदा सूक्ष्मजीव जैव भार कार्बन (SMBC) के अधिकतम स्तर के कारण हुआ।
- अजैविक उर्वरकों को FYM के साथ या बिना FYM के विवेकपूर्ण प्रयोग से सरसों की लक्षित उपज 15-20 क्वि./हेक्टेयर की प्राप्ति हेतु मृदा परीक्षण लक्षित उपज (ST-TY) समीकरण का सत्यापन परीक्षण किया गया। लहसुन के पोषक तत्वों की आवश्यकता, मृदा परीक्षण, उर्वरक दक्षता और जैविक दक्षता के आधार पर ST-TY समीकरण बनाया गया।
- एक अध्ययन जो खनिज उर्वरक के स्थान पर कंपोस्ट उपयोग द्वारा मिट्टी के कार्बन गतिशीलता और फसल उपज को प्रभावित करनेवाले मार्ग को जानने को लक्षित था, 100% NPK की तुलना में कंट्रोल (नियंत्रण) और '50% NPK + 50% कंपोस्ट' ट्रीटमेंट से कुल SOC (मृदा जैविक कार्बन) की मात्रा में 20-24% तक वृद्धि हुई। इन कंपोस्ट-आधारित ट्रीटमेंटस ने सर्वाधिक उच्च कार्बन पूल प्रबंधन सूचकांक (CPMI) और उत्कृष्ट मृदा जैविक कार्बन सिक्वेशट्रेशन दर का प्रदर्शन किया।
- विविध आकृति और जैव रासायनिक गुणों के आधार पर पटसन पौधे की जड़वाले हिस्सों (राइजोस्फ़ेयर) से पृथक किए गए घुलनशील फास्फेट और पोटेशियम बैक्टीरिया की पहचान बैसिलस और प्स्यूडोमोनस पीढ़ी के रूप में किया गया। यह उपलब्धि पटसन और संबद्ध रेशा उत्पादन में एकीकृत पोषण प्रबंधन रणनीतियों द्वारा मृदा स्वास्थ्य, सूक्ष्मजीव गतिविधि और फसल उत्पादकता बढ़ाने के महत्व को रेखांकित करता है।
- पटसन फसल की ऊर्जा दक्षता को सार्थक रूप से इष्टतम सिंचाई प्रथाओं द्वारा सुधारा जा सकता है। उपलब्ध मिट्टी की नमी (DASM) में 50% कमी होने पर स्प्रिंकलर सिंचाई सबसे दक्ष ऊर्जावाला तरीका साबित हुआ है, जिससे उत्पादन में 15% की वृद्धि होती है। यह पारंपरिक सिंचाई विधि की तुलना में 40% अधिक शुद्ध ऊर्जा रिटर्न देती है। इसके अलावा 75% DASM पर सतही सिंचाई से ऊर्जा दक्षता और शुद्ध ऊर्जा रिटर्न में बढ़ोतरी होती है।

- पटसन फसल प्रारंभिक विकास की अवस्था में जलभराव के प्रति अत्यधिक संवेदनशील होती हैं। बुवाई के 30, 45 और 60 दिन बाद जलभराव (DAS) पटसन की वृद्धि और उपज पर नकारात्मक प्रभाव होता है। सबसे गंभीर प्रभाव 30 दिन वाले पौधों पर देखा गया है, जिसमें रेशा उपज में 40-48% तक की चौंकाने वाली कमी आती है। प्रारंभिक चरण के जलभराव के प्रति कैप्सुलरिस पटसन किस्म (JRC J11) ओलिटोरियस किस्म (JRO 204) की तुलना में 30 और 45 DAS पर बेहतर सहिष्णुता का प्रदर्शन करती है।
- जलभराव की स्थिति में पटसन के 45 दिन वाले पौधों में विभिन्न मोर्फो-फिजियोलोजिकल मापदंड अर्थात पौधे की ऊँचाई (14.8-22.1%), आधार व्यास (6-19.2%), शुष्क जैवभार (14.1-30.9%), क्लोरोफिल सामग्री (1.9-35.5%), और सापेक्ष जल सामग्री (2.5-9.2%) में गिरावट देखी गई। यह सफेद पटसन (*C. capsularis*) की तुलना में तोषा पटसन (*C. olitorius*) को अधिक प्रभावित करता है, जो पटसन उत्पादन हेतु क़िस्मों का चयन और लक्षित सिंचाई प्रबंधन के महत्व को उजागर करता है।
- एक नयी परियोजना पर कार्य जारी है, जिसमें स्मार्ट सेंसर के उपयोग द्वारा पटसन फसल में वास्तविक समय जल प्रबंधन हेतु एक बुद्धिमान सिंचाई प्रणाली विकसित करना है। इसका उद्देश्य विशेष रूप से परिवर्तनशील जलवायु की दशा में अनुसूचित जाति के कृषक समुदाय के लिए जल उपयोग दक्षता, उत्पादकता और लाभप्रदता को बढ़ाना है।

जलवायु परिवर्तन और लचीली कृषि

- हाल के अध्ययनों के आधार पर पटसन और केनाफ आशाजनक दीर्घकालिक फसल के रूप में सामने आई है , जो उनके कार्बन सिक्वेशट्रेशन , बायोफ्यूल उत्पादन और बेहतर तरीके से मिट्टी उर्वरता प्रबंधन क्षमता को उजागर करता है।
- एडी कोवेरियंस मापों से स्पष्ट हुआ है कि पटसन और धान के खेत शुद्ध कार्बन सिंक के रूप में कार्य करते हैं, जिनका मौसमी संचयी शुद्ध पारिस्थितिकी विनिमय (seasonal cumulative net ecosystem exchange) क्रमशः -260.7 gC/m^2 और -207.4 gC/m^2 है। सटीक फसल प्रबंधन रणनीतियों की जानकारी हेतु ऊर्जा संतुलन घटकों जैसे शुद्ध विकिरण, मिट्टी का ऊष्मा प्रवाह, संवेदनशील ऊष्मा प्रवाह और निहित ऊष्मा प्रवाह का भी मापन किया गया।
- जीवन चक्र विश्लेषण से स्पष्ट हुआ है की पटसन और केनाफ सेलुलोजिक बायोमास से जीवाश्म ईंधनों की तुलना में 78-81% तक कम ग्रीनहाउस गैस का उत्सर्जन होता है। यह फीडस्टॉक्स जैसे गन्ना बागास, मक्का के डंठल, चावल की भूसी और गेहूं की भूसी से भी बेहतर परिणाम देता है।
- पश्चिम बंगाल के पटसन उत्पादक जिलों के स्थानिक मृदा उर्वरता मानचित्रों से मिट्टी की घटती उर्वरता के रुझानों की जानकारी मिलती है। आर्थिक रूप से महत्वपूर्ण गंगा के मैदानी और उत्तरी उप-हिमालयी क्षेत्र में ICAR-CRIJAF तकनीकों द्वारा दीर्घकालिक तौर पर फसल की उपज के साथ-साथ पोषक तत्वों की भी उपलब्धता हो सकती है।
- पश्चिम बंगाल में वर्ष 1994-2023 के दौरान पटसन उत्पादन की जलवायु प्रवृत्ति विश्लेषण (उच्च-रीजोलुयशन साप्ताहिक ग्रिडेड वर्षा और तापमान के आंकड़ों के आधार पर) से जलवायु परिवर्तन के प्रति पटसन उत्पादन संवेदनशीलता का पता चलता है।

फसल प्रबंधन

- पटसन आधारित फसल प्रणालियों के शोध से यह पता चलता है कि एकीकृत पोषण प्रबंधन से प्राप्त पटसन और धान की उपज पारंपरिक अजैविक उर्वरक उपयोग विधि से प्राप्त उपज के समतुल्य थी। पारंपरिक विधियों की तुलना में जैविक विधि से मिट्टी कार्बन प्रबंधन का कार्य बेहतर होता है।
- सीसल के बड़े आकार वाले सकर का रोपण उच्च उर्वरक दर के साथ करने से अधिकतम रेशा उपज की प्राप्ति होती है। मध्यम आकार वाले सकर भी उच्च उर्वरक दर के प्रयोग की दशा में अच्छा प्रदर्शन करते हैं।
- छिटकवा विधि द्वारा पटसन को हरी मूंग और काले चने की इंटरक्रॉपिंग से श्रम लागत में बचत के साथ-साथ पटसन समतुल्य उपज 27 क्वि./है. तक बढ़ाने की संभावना देखी गई है।
- फ्लैक्स में एकीकृत पोषण प्रबंधन के तहत, 50% अजैविक NPK का प्रयोग FYM और एज़ोटोबैक्टर इन्क्यूलेशन के साथ करने पर 100% अजैविक NPK के समान रेशा उपज की प्राप्ति हुई। यह उपज बिना उर्वरक वाले कंट्रोल प्लाट की तुलना में 85-110% अधिक था।

कटाई पश्चात-फसल प्रबंधन और मूल्य संवर्धन

- मुक्त प्रवाह विधि द्वारा सड़न ने जल की आवश्यकता को आश्चर्य ढंग से 72.4% तक कम कर दिया। पारंपरिक सड़न की तुलना में इस विधि द्वारा रेशा उपज में वृद्धि के साथ-साथ रेशा निष्कर्षण के लिए प्रति क्विंटल रेशा के लिए 7135 ली. जल की जरूरत तथा इसकी रेशा शक्ति (26.5 ग्रा./टेक्स), कम जड़ सामग्री (2.3%) और दोष (0.55%) होती है।

- विस्तृत रूप से 240 विकास खण्ड के 2.25 लाख हेक्टेयर में लागू Jute-ICARE परियोजना ने 600 मीट्रिक टन प्रमाणित बीज, 650 मीट्रिक टन क्रिजैफ़ सोना, 500 फसल कटाई परीक्षण और 500 उन्नत उत्पादन विधियों के प्रदर्शन द्वारा 5 लाख किसानों को लाभान्वित किया है।
- किसानों के खेत पर उन्नत उत्पादन तकनीकों के प्रदर्शन से पटसन की उत्पादकता में सार्थक वृद्धि देखी गई जो किसानों की वर्तमान प्रथा और फसल की पूर्ण क्षमता के बीच उपज अंतर को प्रभावी ढंग से कम कर रही है। देश के प्रमुख पटसन उत्पादक राज्यों में इस उपज अंतर को पश्चिम बंगाल में 52-74%, असम में 53-67%, बिहार में 42.99-59.77%, ओडिशा में 48-54%, और मेघालय में 51% कम करने में महत्वपूर्ण रही है। परियोजना क्षेत्र के किसानों द्वारा प्रमुख उन्नत कृषि प्रथाओं को व्यापक रूप से अपनाया गया है, जिसमें लगभग 80% बीजोपचार, 50% पंक्तिबद्ध बुवाई और 50% यांत्रिक खरपतवार प्रबंधन विधि का प्रयोग कर रहे हैं।
- इन सुधारों के संचयी प्रभाव से कृषि आय में ₹ 25,000-30,000/है. की वृद्धि हुई है। ऐसा उत्पादन लागत में कमी, रेशा उपज के साथ-साथ गुणवत्ता में सुधार और कच्चे पटसन की खरीद प्रक्रिया में मध्यस्थों के उन्मूलन से संभव हुई। प्रदर्शित पटसन उत्पादन की तकनीकों ने कष्ट साध्य श्रम की मात्रात्मकता में कमी द्वारा सुखद परिणाम दिए। मैनुअल विधियों की तुलना में कष्ट साध्य श्रम में 11-15% तक की कमी देखी गई।
- स्वयं सहायता समूह (SHG) के सदस्यों द्वारा विविध पटसन उत्पादों के उत्पादन से वार्षिक आय प्रभावशाली ढंग से ₹ 7.2 लाख तक पहुंच गई।

यांत्रिकीकरण एवं ऊर्जा प्रबंधन

- एक बिजली से चलने वाली जूट रिबनर मशीन 4,000-5,000 पौधों को प्रसंस्कृत करने में सक्षम है, जिसका रेशा निष्कर्षण दक्षता 90% से अधिक है। किसानों द्वारा अपनाए जानेवाले पारंपरिक सड़न विधि की तुलना में यह 7-8% अधिक रेशा उपज देता है।
- संशोधित CRIJAF नेल वीडर में 4 नेल के एक दूसरे सेट से निराई और विरलीकरन दक्षता में सुधार हुआ है। एक बहु-फसल बीज ड्रिल मशीन, जिसकी प्रभावी क्षेत्र क्षमता 0.36-0.38 है./घंटा और 80-85% समानता के साथ बीज की बुवाई तथा बीज से बीज की दूरी कायम रखता है। यांत्रिक निराई के साथ इसका प्रयोग करने पर मानव श्रम में 60% बचत के साथ ₹6,500-11,500/है. की बचत होती है। इसके अतिरिक्त, एक बैटरी से चलने वाला खरपतवार हटाने वाला यंत्र जिसकी क्षेत्र क्षमता 0.06-0.07 है./घंटा है। इसकी निराई सूचकांक 83-85% है, क्षेत्र की दक्षता को बढ़ाता है और निराई कार्यों में होनेवाले कष्ट साध्य श्रम में कमी लाता है।

फसल सुरक्षा

- पटसन की दो संवेदनशील किस्मों, J R C - 4 1 2 (*C. capsularis*) और JRO-524 (*C. olitorius*) में तना सड़न रोगजनक के संक्रमण पर बाह्य आकृति (फेनोटाइपिक) और कायिक विविधता बहुत स्पष्ट थी, जो घाव के आकार में वृद्धि, जल तनाव और पत्तियों के झुकने, टर्गिडिटी ह्रास से संबंधित थी। तनाव के लक्षणों के बढ़ने से पत्ते की झिल्ली की स्थिरता बाधित हुई, जिससे कोशिकाओं से इलेक्ट्रोलाइट का रिसाव हुआ। पत्तों में प्रकाश संश्लेषण की दर पर प्रतिकूल प्रभाव पड़ा। 4 DAI के बाद, अंधेरा में श्वसन की क्रिया में धीरे-धीरे वृद्धि हुई और 7 DAI पर बहुत कम हो गई। इसका मतलब यह हुआ कि रोगजनक के कारण पत्तियों द्वारा शुद्ध कार्बन का स्थिरीकरण नकारात्मक हो गया।
- *M. phaseolina* के एक विरुलेंट आइसोलेट से F2 पीढ़ी के 219 पौधों (शामिल दो माता-पिता भी) को संक्रमित किया गया। दो दिनों के बाद घाव की लंबाई मापी गई। आंकड़ों के आधार पर, जनसंख्या को संवेदनशील और प्रतिरोधी वर्गों में विभाजित किया जा सकता है।
- एक सौ सत्तर पटसन जर्मप्लाज्म का परीक्षण बैरकपुर (बीमार भूखंड) और सोरभोग (हॉटस्पॉट) में किया गया। सबसे कम रोग ग्रसित पांच जर्मप्लाज्म का परीक्षण बीमार भूखंड के तहत पुन: कृत्रिम संक्रामक तकनीक द्वारा किया गया। सार्थक रूप से जर्मप्लाज्म लाइन, OIN 148 और OIN 852 में तना सड़न रोग सीमित थी जो भविष्य में प्रजनन कार्यक्रम को आगे बढ़ाने के लिए प्रतिरोध का स्रोत हो सकता है।
- सुरक्षा के लिहाज से पटसन के प्रमुख कीटों के प्रबंधन हेतु मध्यम विषाक्तता वाले जैव-युक्त कीटनाशकों को लक्षित कीटों और प्राकृतिक शत्रु के प्रति मूल्यांकन किया गया। हालांकि स्पाइरोमेसीफेन और फेनपायरोक्सिमेट ने पीली मकड़ी के जनसंख्या घनत्व को अर्थपूर्ण ढंग से निष्प्रभावी कर दिया। नीम फॉर्मूलेशन (10000 ppm) और पोंगामिया कीटनाशक साबुन

को खनिज तेल के मिश्रण को पीली मकड़ी के प्रति कारगर पाया गया।

- हेयरी कैटरपिलर के तीसरे इन्स्टार लार्वा के प्रति Bt फॉर्मूलेशन, वनस्पति (करणजिन, पौधों पर आधारित कीटनाशक साबुन) और सुरक्षित कीटनाशकों की विषाक्तता का निर्धारण किया गया। सबसे अधिक विषाक्तता स्पिनोसाड और स्पाइरोमेसिफेन ट्रीटमेंस (उपचारों) में दर्ज की गई, जो डेक्सट्रोज आधारित Bt फॉर्मूलेशन के समकक्ष थी। करणजिन 2EC (पोंगामिया का सक्रिय घटक), टैल्क आधारित Bt फॉर्मूलेशन और स्पाइरोमेसिफेन की विषाक्तता क्रमशः 80%, 86% और 83% लार्वा मृत्यु दर के समतुल्य थी।
- पटसन उत्पादन प्रणाली में किस्मों और मिट्टी में सल्फर के एकीकृत प्रयोग से उत्पादन के प्रारंभिक चरण में इंडिगो कैटरपिलर का संक्रमण JRO 204 की तुलना में JROBA 3 में कम था। इंडिगो कैटरपिलर के प्रति मिट्टी में सल्फर का प्रयोग और क्लोरान्ट्रानिलिप्रोल (18.5% SC) का पत्तियों पर छिड़काव सबसे प्रभावी था। किस्मों और सल्फर उपचार का प्रभाव पौधों की ऊँचाई और इसके आधार व्यास पर स्पष्ट रूप से था। यह अन्तर सबसे अधिक JROBA 3 किस्म में सल्फर उपचारित मिट्टी में (@ 40 कि.ग्रा./है.) था।
- पटसन की सबसे अधिक रेशा उपज रासायनिक आईपीएम (IPM) मॉड्यूल जिसमें बीजोपचार कार्बेंडाजिम @2 ग्रा. + इमिडाक्लोप्रिड @ 4 मि.ली./कि.ग्रा.) के बाद क्रमशः एक स्प्रे एकारिसाइड (स्पायरोमेसिफेन 240 एस.सी. @ 0.7 मि.ली./ली.), कीटनाशक λ-साइहलोथ्रिन 5 ईसी @ 0.6 मि.ली./ली. और फफूंदनाशक (टेबुकोनाज़ोल 250 ईसी @ 1 मि.ली./ली.) करने पर सबसे कम तना सड़न, पीली मकड़ी, सेमीलूपर का प्रकोप देखा गया। प्रदर्शन के आधार पर रासायनिक आईपीएम मॉड्यूल के बाद जैविक प्रबंधन और कल्चरल ऑपरेशन आधारित आईपीएम मॉड्यूल का स्थान था।
- मेस्ता के सभी प्रमुख कीटों के प्रबंधन में रासायनिक कीटनाशक आधारित आईपीएम मॉड्यूल ने सभी अन्य मॉड्यूल की तुलना में सबसे अच्छा प्रदर्शन किया। सबसे कम क्षति प्रतिशत रोमिल कैटरपिलर, मीली बग और जेसीड्स द्वारा दर्ज की गई। किसानों के प्रचलित प्रथा की तुलना में रासायनिक आईपीएम मॉड्यूल ने सबसे अधिक उपज में वृद्धि का प्रदर्शन किया।
- मीली बग के जीवन चक्र मॉडलिंग हेतु तापमान का उपयोग एक व्याख्यात्मक वेरियबल (कारक) के रूप में किया गया। इसके विकास दर और मृत्यु दर के अनुमान हेतु क्रमश: लोगन और जानिश मॉडल का उपयोग किया गया। कीटों के अधिकतम विकास हेतु अनुकूल तापमान 34–35°C था, जबकि न्यूनतम मृत्यु दर 33°C पर दर्ज की गई।
- विभिन्न मौसम मापदंडों - अधिकतम और न्यूनतम तापमान, सापेक्ष आर्द्रता और वर्षा - और कीट संक्रमण के बीच सहसंबंध का विश्लेषण वर्तमान सप्ताह, एक सप्ताह के अंतराल और दो सप्ताह के अंतराल अवधि के लिए किया गया था। विश्लेषण से पता चला कि दो सप्ताह के अंतराल वाले मौसम के आंकड़ों ने कीट संक्रमण के साथ सबसे अधिक सहसंबंध दिखाया।
- स्वतंत्र कारक के रूप में मौसम के मापदंडों पर आधारित पूर्वानुमान मॉडल विकसित किया गया है, ताकि बहु-चरणीय प्रतिगमन द्वारा बुवाई के सप्ताह से शुरू करके प्रत्येक सप्ताह में पीली माइट, जूट सेमी-लूपर और रोयेंदार कैटरपिलर की उच्चतम जनसंख्या का पूर्वानुमान लगाया जा सके।

कृषि प्रसार

- ICAR-CRIJAF सक्रिय रूप से पटसन उत्पादन को बढ़ावा देने और पश्चिम बंगाल के प्रमुख पटसन उत्पादक जिलों के किसानों को मदद कर रहा है। राष्ट्रीय खाद्य सुरक्षा मिशन (NFSM) कार्यक्रम के तहत, उच्च उपज देने वाली पटसन किस्मों और उन्नत उत्पादन तकनीकों पर अग्रिम पंक्ति प्रदर्शन आयोजन से औसतन रेशा उपज में 12-18% की वृद्धि हुई। संस्थान ने किसानों को इन प्रदर्शनों के आयोजन हेतु पटसन के बीज और कृषि उपकरण उपलब्ध कराये।
- ICAR-CRIJAF ने अनुसूचित जाति उप-योजना (SCSP) और अनुसूचित जनजाति (ST) कार्यक्रमों के तहत विभिन्न पहलों को लागू किया, जिसमें क्रमशः 18,000 अनुसूचित जाति और 1,720 अनुसूचित जनजाति के किसानों को लाभ हुआ। इन पहलों में प्रशिक्षण कार्यक्रम, क्षेत्रीय प्रदर्शन, जागरूकता अभियान, बीज, उर्वरक, वर्मीकंपोस्ट बेड , फसल सुरक्षा किट सहित कृषि उपकरण का वितरण शामिल था।
- संस्थान ने किसानों, कृषक महिलाओं और विस्तार कर्मियों के लिए पटसन और संबद्ध रेशा तकनीकों पर 85 विभिन्न प्रशिक्षण कार्यक्रम आयोजित किए। इसमें Jute-ICARE, ATMA, DST- SEED और KVK जैसे बाह्य वित्त पोषित परियोजनाओं के तहत लगभग 2470 प्रतिभागियों को कवर

किया गया। पटसन आधारित कृषि प्रणालियों को बढ़ावा देने के लिए ICAR-CRIJAF ने सब्जी उत्पादन, मत्स्य पालन, वर्मीकंपोस्टिंग और जैविक खेती जैसे उद्यमों को भी समर्थन प्रदान किया।

- संस्थान ने उत्तर पूर्वी पहाड़ी (NEH) घटक के तहत जागरूकता कार्यक्रम आयोजित किया। 1,700 से अधिक किसानों को कृषि इनपुट वितरण के साथ- आर्किड की खेती पर प्रशिक्षण और रोपण सामग्री प्रदान किया गया।
- मेरा गांव मेरा गौरव (MGMG) कार्यक्रम का क्रियान्वयन 43 गाँवों में किया गया। बेहतर उत्पादन के लिए बीज, उर्वरक, रसायन, कृषि मशीनरी आदि जैसे कृषि इनपुट का वितरण किया गया। कृषक समुदाय को जागरूक करने हेतु राष्ट्रीय महत्व के संवेदनशील मुद्दों जैसे- स्वच्छ भारत अभियान, जलवायु परिवर्तन, जल संरक्षण, मृदा उर्वरता आदि के प्रति जागरूकता कार्यक्रम आयोजित किए गए।
- ICAR-CRIJAF ने सक्रिय रूप से स्वच्छ भारत मिशन कार्यक्रम के तहत स्वच्छता अभियान और जागरूकता अभियान द्वारा स्वच्छ भारत दिवस, स्वभाव स्वच्छता संस्कार स्वच्छता, एक पेड़ मां के नाम, स्वच्छता संवाद और स्वच्छता ही सेवा में भाग लिया।
- महिला किसानों द्वारा सामना की जाने वाली चुनौतियों को पहचानते हुए, संस्थान ने महिलाओं के अनुकूल कृषि उपकरणों को पेश करने, उनके कौशल और उद्यमिता क्षमताओं को बढ़ाने, और सामूहिक उद्यमिता को बढ़ावा देने और उनके उपक्रमों का समर्थन करने के लिए स्वयं सहायता समूहों (SHGs) के गठन को प्रोत्साहित करने के लिए कार्यक्रम लागू किए। ये पहलकदमी पश्चिम बंगाल में ग्रामीण महिलाओं के सशक्तिकरण और क्षेत्र में जूट क्षेत्र के समग्र विकास में महत्वपूर्ण योगदान दिया है।

EXECUTIVE SUMMARY

ICAR- Central Research Institute for Jute and Allied Fibres (ICAR-CRIJAF) has the mandate to carry out basic, strategic and applied research aimed at enhancing production, productivity and sustainability of the jute and allied fibre crops in India. The research programmes of the institute are framed around three major theme areas: Crop Improvement, Crop Production and Crop Protection. The newly developed technologies are validated through the All India Network Project on Jute and Allied Fibres (AINP-JAF) and the validated technologies are scaled up among the stakeholders through extension and outreach programmes. During 2024, the institute made significant achievements in research and demonstrated the technologies to jute and allied fibre growing farmers through various programmes. ICAR-CRIJAF had 23 in-house projects and 17 externally funded projects in operation in the year 2024. The executive summary of the report is presented below.

Crop Improvement

Biotechnological Intervention

- CRISPR/Cas vector to be used for genome editing in jute (*Corchorus olitorius*) and flax (*Linum usitatissimum*) was designed by modification of pRGEB31. Synthetic DNA oligonucleotide (pAtU6-gRNA scaffold) flanking with HindIII and SbfI restriction site at both ends was designed. Three traits have been targeted for genome editing, namely, fiber quality improvement, improvement of herbicide resistance and prevention of early flowering in jute. Guide RNAs were designed for 12 genes.
- Flax variety JRF 2 was regenerated using silver nanoparticles. *In-vitro* shoot regeneration system was developed for the jute varieties JRO 524 (*C. olitorius*) and JRC 212 (*C. capsularis*). JRO 524, hypocotyl explants demonstrated notable regeneration potential, forming callus and regenerating shoots on on SM3 and SM medium. In JRC 212, the hypocotyl and cotyledonary leaves displayed significant swelling and bulging on ASRM medium.
- 30 out of 99 jute-specific Intron Linked Polymorphic (ILP) markers were polymorphic between parents WCIN 183A and OIN456. From jute genome 170 Resistance Gene Analogs (RGAs) containing NBARC domains were identified.
- CAPOLI (*C. capsularis* x *C. olitorius*) jute showed phenomenal yield improvement as high as 62 and 74 % over their founders. Genotypic effects on fibre yield and stem-base diameter were consistent over the years. The bast fibre yield improvement in CAPOLI jute was not due to high fibre content, as there was no difference between fibre content of *C. olitorius* and CAPOLI. CAPOLI jute showed more compact and dense FCBs.
- 66, 47, and 72 wild-type (Col-0) *Arabidopsis* plants were transformed with three constructs containing flax heat shock proteins (LuHSFA2a, LuHSFA2b, and LuNAC003), respectively, of which 9, 29, and 5 calli, respectively, have successfully undergone selection and produced a green organogenic calli mass.
- Thirty-eight MITE insertion polymorphism markers were amplified and 16 markers were found to be polymorphic in 28 jute germplasm. Out of 32 SSR markers and 5 ISSR markers, 4 SSR and 5 ISSR markers produced a total of 37 bands/alleles.
- Physical pretreatment with steam, chemical pretreatments with acid and alkali, followed by enzymatic treatment achieving over 75% delignification of kenaf biomass. A green technology for cellulolytic enzyme production in situ was developed for *Trichoderma resei*. Saccharification of

jute using microbial culture resulted in production of over 500 mg of reducing sugar per gram dry biomass.

Breeding for Fibre Yied and Quality

- JROBA-3 × OIJ-161 (26.00 g/plant), JROBA-3 × WCIN-136-1 (20.00 g/plant), JROBA-3 × WCIN-179 (19.75 g/plant), JRO-204 × WCIN-136-1(11.78 g/plant), and JRO-204 × WCIN-179 (5.21 g/plant) were observed as best heterotic combinations for fiber yield, making them promising candidates for improving jute production.
- Out of the 100 germplasm, 12 showed significantly lower mite infestation levels compared to the check variety. OIN-082 (21.33 mites/cm^2), and OEX-013 (24.66 mites/cm^2), OEX-32 (30.00 mites/cm^2), OEX-07 (40.00 mites/cm^2) and OIJ-98(43.84 mites/cm^2) demonstrated consistent tolerance across two consecutive seasons. Out of 70 tossa jute genotypes and 10 white jute genotypes screened for resistance to stem rot, five of white jute and tossa jute exhibited tolerance to the pathogen.
- Out of 92 genotypes screened, OIN-0945, recorded the highest green weight (555 g), OIN-1159 had the highest dry fibre weight (44.4 g), OIJ-040 exhibited excellent plant height (440 cm) and OIJ-280 demonstrated superior basal diameter (2.28 cm). Taller plants, higher node counts, and greater basal diameter contribute positively to fibre yield. Out of 150 F_4 progenies exhibited promising traits such as stem rot resistance, non-branching and non-flowering. Out of 45 F_4 lines of white jute (*C. capsularis* L.), top five lines (F4-38, F4-35, F4-1, F4-9, and F4-37) were identified as superior for fiber yield and agronomic traits.
- The 50% lethal dose (LD50) value for tossa jute has been established at a concentration of 1% when treated with EMS for a duration of 4 hours. 5000 plants from the M_1 generation, derived from the M_0 mutation population, were grown in progeny rows. Equal quantity of seeds from 891 M_0 plants was bulked to develop 50,000 M_1plants.
- New climate smart white jute variety JRC 9 (Namita) with high disease-pest and waterlogging tolerance coupled with high fibre yield and fine fibre was formally released by Hon'ble Prime Minister on 11.08.2024 as one of the 100 climate-smart crop varieties and was notified vide Gazette Notification No. S.O. 4388(E) 08.10.2024. JRC 9 exhibited average productivity of 32 q/ha over diverse locations during varietal evaluation. In specific locations, it produced 43.7 q/ha comparable to tossa jute yield.
- Four varieties of jute and allied fibre crops namely, JRCP 7 of *capsularis* jute, JROP 4 and JROV 5 of *olitorius* jute and JBMP 6 of HC mesta had been released and notified vide the Gazette of India. Besides, one variety each of white jute (JRC 9) and tossa jute (NJ 7068) have also been released. One variety of HS mesta (AMV-11) has been identified for central release during the 35th Annual Workshop of AINPJAF.
- At 60 days of harvesting, genotypes OIJ-173 and OIJ-12 exhibited the shortest retting period of 5 days among the genotypes under study. At 105 days, OIJ-173 showed the shortest retting duration of 9 days. After 120 days of harvesting, tossa jute genotype SS-02 displayed the shortest retting length (11 days).

Genetic Resources and Crop Improvement

- The medium-term storage facility at ICAR-CRIJAF, Barrackpore maintains 5950 germplasm of jute and allied fibers. A total of 371 jute and allied fibres germplasm lines were distributed to indenters including scientists of ICAR-CRIJAF, AINP on Jute and Allied Fibres and other institutes. A total of 951 jute and allied fibre germplasm lines were regenerated. A total of six lines are being evaluated in station trial with check JRF 2 in the current Rabi season 2024-25. A total of 357 germplasm lines including 90 exotic accession are in maintenance breeding.
- Seven out of 150 tossa jute displayed tolerance to premature flowering, with fewer than five percent of the plants exhibiting early flowering at the February 15, 2024 sowing. The same lines demonstrated no flowering when sown on March 1, 2024. 2 each genotype from *C. tridens* and *C. aestuans* were found to be highly tolerant and 1 genotype from *C. pseudo-olitorius* was found to be highly susceptible to jute semilooper.
- Two distinct core collections were developed: one comprising 76 accessions (4.15%) using the M-strategy, and another consisting of 92 accessions (5.02%) developed through a random search algorithm. 45

accessions were common to both sets. The coincidence rate between the core collection and the entire collection was determined to be 96.16%.

- Twenty-one accessions were superior in fibre fineness than the best check variety JRO 2407, but No germplasm recorded higher yield than the best check varieties JRO 2407 and JRO 204. Four lines have been crossed with seven testers for enhancing fibre quality.
- Ten varieties of two species of *Corchorus* i.e. *C. olitorius* (23JU05T, 23JU06T, 23JU07T, 23JU08T, 23JU09T and 23JU10T) and *C. capsularis* (23JU01T, 23JU02T, 23JU03T and 23JU04T) were tested in DUS trial during 2023-24. One white jute variety JRCJ 11 has been registered for protection (date of grant of certificate-17.10.2024) after completion of DUS testing. Applications for registration of two varieties JROP 4 and JRCP 7 have been sent to the PPVFR authority and currently under DUS trial during 2024-25.
- Draft DUS test guidelines was presented at taskforce committee meeting held on 18.12.2023. DUS test guidelines was finalized incorporating all the suggestion received from taskforce committee members and submitted to the PPVFR Authority for consideration on 25.01.2024. Seeds of all varieties/lines have been multiplied.
- A total of 9.57 q breeder seed of jute and 7.0 q of sunnhemp were produced during kharif 2023 against the DAC indent (2024-25) of 4.97 q and 0.90 q, respectively. 3.5 q of breeder seed of flax variety JRF-2 was also produced during rabi 2023. Grow out test (GOT) was carried out to check the genetic purity of the breeder seeds of all the indented varieties of jute. A total of 229.6 kg of nucleus seeds of the released varieties of jute were produced. Approximately 725.41 q of TL seed has been produced in 2024.

Crop Production

Soil and Water Productivity

- The long-term fertilizer experiment at CRIJAF revealed that the 100% NPK+FYM treatment resulted in the highest organic carbon content of 0.90%, significantly enhancing soil fertility compared to other treatments. The integrated nutrient management approach stimulated microbial activity in the soil, by maximizing levels of enzymatic activities like FDA, DHA, phosphatase, and soil microbial biomass carbon (SMBC).
- Verification trials of the Soil Test Targeted Yield (ST-TY) equation for mustard successfully achieved the targeted yield of 15-20 q/ha through the judicious application of inorganic fertilizers with or without FYM. The ST-TY equation for garlic was also derived, considering nutrient requirements, soil tests, fertilizer efficiency, and organic efficiency.
- A study exploring the pathways through which mineral fertilizer replacement with compost affects soil carbon dynamics and crop yields found that compared to 100% NPK, the control and '50% NPK + 50% Compost' treatments significantly increased total SOC content by 20-24%. These compost-based treatments also exhibited the highest carbon pool management index (CPMI) and superior soil organic carbon sequestration rates.
- Phosphate and potassium solubilizing bacteria isolated from jute rhizosphere soil in West Bengal displayed diverse morphological and biochemical characteristics, with Bacillus and Pseudomonas being the probable genera identified based on their biochemical properties. These findings underscore the importance of integrated nutrient management strategies in enhancing soil health, microbial activity, and crop productivity in jute and allied fibre cultivation.
- The energy efficiency of jute crops can be significantly improved through optimized irrigation practices. Sprinkler irrigation at 50% depletion of available soil moisture (DASM) has proven to be the most energy efficient method, resulting in a 15% boost in output energy and an impressive 40% increase in net energy

returns compared to traditional irrigation methods. Surface irrigation at 75% DASM also shows promise in enhancing energy efficiency and net energy returns in jute cultivation.

- Jute crops are highly susceptible to waterlogging stress, particularly during the early growth stages. Waterlogging at 30, 45, and 60 days after sowing (DAS) can have detrimental effects on jute growth and yield, with the most severe impact observed in 30-day-old seedlings, leading to a staggering 40-48% reduction in fibre yield. The capsularis jute variety (JRC J11) exhibits better tolerance to early-stage waterlogging at 30 and 45 DAS compared to the olitorius variety (JRO 204).
- Jute plants subjected to waterlogging stress at 45 days of age experience a decline in various morpho-physiological parameters, including plant height (14.8-22.1%), basal diameter (6-19.2%), dry biomass (14.1-30.9%), chlorophyll content (1.9-35.5%), and relative water content (2.5-9.2%). Furthermore, Tossa jute (*C. olitorius*) is more adversely affected by waterlogging stress than White jute (*C. capsularis*), highlighting the importance of varietal selection and targeted irrigation management for optimal jute production.
- A new project is underway to develop an intelligent irrigation system leveraging smart sensors for real-time water management of jute crops, aiming to increase water use efficiency, productivity and profitability for SC farming communities in the face of climate change.

Climate Change and Resilient Agriculture

- Jute and kenaf are emerging as promising sustainable crops, with recent studies highlighting their potential for carbon sequestration, biofuel production, and optimized soil fertility management.
- Eddy covariance measurements revealed that jute and rice fields act as net carbon sinks, with seasonal cumulative net ecosystem exchanges of -260.7 gC/m² and -207.4 gC/m² respectively. Energy balance components like net radiation, soil heat flux, sensible heat flux and latent heat flux were also quantified to inform precise crop management strategies.
- Life-cycle analysis indicated that bioethanol derived from jute and kenaf cellulosic biomass can slash greenhouse gas emissions by an impressive 78-81% compared to fossil fuels, outperforming feedstocks like sugarcane bagasse, corn stover, rice straw and wheat straw.
- Spatial soil fertility maps of jute-growing districts in West Bengal revealed decreasing soil fertility trends, but adopting CRIJAF technologies could help optimize nutrient availability and boost sustainable crop yields in the economically vital Gangetic Plains and northern Sub-Himalayan region.
- Climate trend analysis of the jute growing season in West Bengal from 1994-2023 using high resolution weekly gridded rainfall and temperature data revealed important insights that can help assess the vulnerability of jute production to climate change.

Crop Management

- Research into jute-based cropping systems demonstrated that integrated nutrient management produces jute and rice yields on par with conventional inorganic fertilizer use, and organic approaches result in better soil carbon management compared to conventional methods.
- Agronomic trials in sisal showed that planting large suckers combined with high fertilizer rates maximizes fibre yields, with medium sucker sizes also performing well under high fertilization.
- Innovations like intercropping broadcast-sown jute with green gram and black gram show promise for increasing jute equivalent yields by up to 27 q/ha while reducing labour requirements.
- In flax, integrated nutrient management using 50% inorganic NPK along with FYM and Azotobacter inoculation produced statistically similar fibre yields to 100% inorganic NPK application, and 85-110% greater yields than unfertilized controls.

Post-Harvest Management and Value Addition

- The free-flowing method of retting has dramatically reduced water requirements by 72.4% to just 7135 liters per quintal of fibre extraction, while simultaneously increasing fibre recovery, strength (26.5 g/tex), and quality with the lowest root content (2.3%) and defects (0.55%) compared to conventional retting methods.
- The extensive Jute-ICARE project, spanning 240 blocks and involving 5 lakh farmers cultivating 2.25 lakh hectares, has promoted the use of 600 MT certified seeds and 650 MT of the improved CRIJAF Sona variety through 500 crop cutting experiments and 500 demonstrations of enhanced cultivation practices.
- Through the demonstration of improved production technologies directly in farmers' fields, jute productivity has seen significant increases, effectively bridging the yield gap between farmers' current practices and the crop's full potential. Across major jute-producing states in India, the extent of this yield gap bridging has been impressive - ranging from 52-74% in West Bengal, 53-67% in Assam, 42.99-59.77% in Bihar, 48-54% in Odisha, and reaching 51% in Meghalaya. Key improved farming practices have seen widespread adoption among farmers in the project areas, with approximately 80% implementing seed treatment, 50% employing line sowing techniques, and 50% utilizing mechanical weed control methods.
- The cumulative impact of these enhancements has been a substantial boost to farm incomes to the tune of ₹ 25000-30000 per hectare, driven by a reduction in cultivation costs, improvements in both fibre yield and quality, and the elimination of intermediaries in the raw jute procurement process. The quantification of drudgery reduction among the demonstrated jute farming technologies yielded promising results. The drudgery was reduced by a substantial 11-15 % compared to manual methods.
- The Self Help Group (SHG) members experienced a steady growth in their income by their production of diversified jute products. SHG's annual earnings from jute goods reached an impressive Rs. 7.2 lakh.

Mechanisation and Energy Management

- Mechanization has played a pivotal role, with the development of a power-operated jute ribboner machine capable of processing 4000-5000 plants per hour with over 90% extraction efficiency, increasing fibre yield from 5-6% to 7-8% compared to traditional whole plant retting.
- The modified CRIJAF Nail Weeder, featuring a second set of 4 nails, has improved weeding and thinning efficiency. A multi-crop seed drill machine, with an effective field capacity of 0.36-0.38 ha/hr and 80-85% uniformity in seed dropping and spacing, reduces manual labour by 60% and saves ₹6500-11,500/ha when combined with mechanical weeding. Additionally, a battery-operated weeder with a field capacity of 0.06-0.07 ha/hr and weeding index of 83-85% enhances field efficiency and reduces drudgery in weeding operations.

Crop Protection

- Phenotypic and physiological variation up on stem rot pathogen inoculation in two susceptible jute cultivars, JRC-412 (*C. capsularis*) and JRO-524 (*C. olitorius*) was very prominent which was associated with increased in lesion size, water stress, drooping of leaves and loss of turgidity. Leaf membrane stability was disrupted as the stress symptoms increased resulting into electrolyte leakage from the cells. Leaf photosynthesis rate was adversely affected. After 4 DAI, dark respiration gradually increased with the stress and became very low at 7 DAI. This implies that under associated stress of pathogen, net carbon fixation by the leaves turned negative.

- From a segregating F2 generation, 219 plants, including two parents, were inoculated with a virulent isolate of *M. phaseolina*. Lesion length was measured after two days. Based on the data, the population could be divided into susceptible and resistant.
- Out of one hundred seventy jute germplasms tested both at Barrackpore (sick plot) and Sorbhog (hotspot), five germplasm with least disease incidence were again tested under sick pot along with artificial inoculation technique. The germplasm lines, OIN 148 and OIN 852 restricted the stem rot disease significantly which may be used as source of resistance for further breeding program.
- The bio-rational pesticides with moderate toxicity on the target pests and safer for natural enemies were evaluated against major pests of jute. Although spiromesifen and fenpyroximate suppressed the mite population with significantly least population density, neem formulation (10000 PPM) and pongamia insecticidal soap in combination with mineral oil were also effective against jute mite.
- The toxicity of Bt formulations, botanicals (Karanjin, plant-based insecticidal soaps) and safer insecticides was determined under laboratory condition on 3rd instar larvae of hairy caterpillar. Highest toxicity was recorded in spinosad and spiromesifen treatments which was at par with dextrose based Bt formulation. The toxicity of karanjin 2EC (active ingredient of pongamia), talc based Bt formulation and spiromesifen were at par with 80%, 86% and 83% larval mortality respectively.
- Integration of varieties and soil S application in on-farm jute production system indicated that infestation of indigo caterpillar in the initial stage of crop establishment was lesser in JROBA 3 than JRO 204. Soil S application and foliar spray of Chlorantraniliprole (18.5% SC) was most effective against indigo caterpillar. The effect of varieties and sulphur treatment was prominent on plant height and basal diameter. These parameters were significantly highest in the variety JROBA 3 treated with Soil S @ 40 kg/ha.
- Chemical IPM module consisting of seed treatment (carbendazim @ 2 g + imidacloprid @ 4 ml/kg) followed by one spray sequentially of acaricide (spiromesifen 240 SC @ 0.7 ml/l), insecticide (λ-cyhalothrin 5 EC @ 0.6 ml/l) and fungicide (tebuconazole 250 EC @1 ml/l) was most effective with lowest stem rot, yellow mite and semilooper and highest fibre yield of jute. Biological control and cultural operation based IPM module were next in performance to chemical IPM module.
- The chemical pesticide based IPM module was the best in managing all the major insect pests of mesta compared to all other modules evaluated with lowest percentage damage of hairy caterpillar, mealy bug and jassids. Chemical IPM module also recorded highest increase in yield over farmers' practice.
- The life cycle modeling of mealybug was conducted using temperature as an explanatory variable. The development rate and mortality of mealybug were estimated using the Logan and Janisch models, respectively. The optimal temperature for development was 34–35°C, while the lowest mortality occurred at 33°C.
- The correlation between different weather parameters (maximum and minimum temperature, relative humidity, rainfall) and insect infestation was analyzed for the current week, one-week lag, and two-week lag periods. The analysis revealed that weather data with a two-week lag showed the highest correlation with insect infestation.
- Forecast models based on the weather parameters as independent variables was developed to forecast highest population of yellow mite, jute semi-looper and hairy caterpillar at each week starting from week of sowing by multiple stepwise regression.

Extension and Outreach

The ICAR-CRIJAF has been actively working to promote jute cultivation and support farmers in major jute-growing districts of West Bengal.

- Under the National Food Security Mission (NFSM) programme, frontline demonstrations on high-yielding jute varieties and improved production technologies were conducted, resulting in a 12-18% increase in average yields. The institute provided jute seeds and farm implements to farmers for these demonstrations.
- ICAR-CRIJAF also implemented various initiatives under the Scheduled Caste Sub-Plan (SCSP) and Scheduled Tribe (ST) programs, benefiting over 18,000 SC and 1,720 ST farmers respectively. These initiatives included training programs, field demonstrations, awareness campaigns, and the distribution of agricultural inputs such as seeds, fertilizers, vermicompost beds, crop protection kits, and farm implements.
- The institute also conducted 85 training programs on jute and allied fibre technologies for farmers, farm women, and extension personnel under external funded projects like Jute-ICARE, ATMA, DST-SEED, and KVKs covering about 2470 participants. To promote jute-based farming systems, ICAR-CRIJAF provided support for enterprises like vegetable cultivation, fishery, vermicomposting, and organic farming.
- Under the North Eastern Hill (NEH) component, the institute undertook awareness programs, distributed agri-inputs, and provided training on orchid cultivation and planting material distribution to over 1,700 farmers.
- The *Mera Gaon Mera Gaurav* (MGMG) program was implemented in 43 villages. Agricultural inputs like seed, fertilizer, chemicals, agricultural machinery, etc. were distributed for improved farming. Awareness programs were conducted to make them aware of the programs on sensitive issues of national importance, such as Swachh Bharat Abhiyaan, climate change, water conservation, soil fertility, etc.
- ICAR-CRIJAF also actively participated in the Swachh Bharat Mission program by organizing cleanliness drives and awareness campaigns under *Swachh Bharat Diwas, Swabhav Swachhata-Sanskar Swachhata*, *Ek Ped Ma Ke Naam*, *Swachhata Samvad* and *Swachhta Hi Seva*.
- Recognizing the challenges faced by women farmers, the institute implemented programs to introduce women-friendly farm implements, enhance their skills and entrepreneurial capabilities, and encourage the formation of Self Help Groups (SHGs) to promote collective entrepreneurship and support their ventures. These initiatives have significantly contributed to the empowerment of rural women in West Bengal and the overall development of the jute sector in the region.

ICAR-CRIJAF: at a Glance

ICAR-CRIJAF (Central Research Institute for Jute and Allied Fibres) is a premier research institute of Indian Council of Agriculture Research (ICAR) situated at Barrackpore, West Bengal (India). The institute mainly deals with six natural fibre crops viz., Jute, Mesta, Sunnhemp, Sisal, Ramie and Flax. To carry out research on various aspects of jute and allied fibres (JAF) the institute has three divisions namely, Crop Improvement, Crop Production and Crop Protection. All India Network Projects (AINP) on Jute and Allied Fibres, and Agricultural Extension is also supporting Research, Development and Transfer of Technology. The Institute spread its sphere of Research activities to the length and breadth of the Nation by establishing its Research Stations in Uttar Pradesh (Sunnhemp Research Station, Pratapgarh), Assam (Ramie Research Station, Sorbhog), Odisha (Sisal Research Station, Bamra) and West Bengal (Central Seed Research Station for JAF, Budbud). Besides, the Institute has nine State Agricultural University (SAU) based and six ICAR institute based collaborating centres for multi-locational testing and validation of the technologies under AINP on JAF. It has two Krishi Vigyan Kendra (KVK) working for the farming community of Purba Burdwan and North 24 Parganas districts of West Bengal. The multi-disciplinary scientific team of the Institute is dedicatedly working towards development of highly productive varieties with high quality fibre which can meet the need to make high value diversified products. Scientists work for resource management in farming for better energy efficiency and economic input allocation, developing suitable agronomic practices supported with farm implements for minimizing climatic change related risks, soil degradation, drudgery, etc. and for socio-economic upliftment of farming community by improvement in agriculture production and efficient utilization of natural resources. Emphasis is also on development of eco-friendly methods for crop management and enhancing livelihood security of farmers through reducing the crop yield losses by management of diseases and insect-pests. Findings of the research activities are instrumental in providing recommendations for developing policies, programmes, models and approaches for sustainable jute and allied fibre production. The main strength of the institute is excellent well trained human resources. Presently the Institute has a total strength of 145 staff with 40 Scientists 59 technical staff, 30 Administrative staff and 16 supporting staff.

History

The Indian Central Jute Committee (ICJC) was formed in 1936 in view of the economic importance of jute in the country. Subsequently Jute Agricultural Research Laboratory (JARL) was established in 1938 at Dhaka of undivided Bengal. After partition (1947), Jute Research Institute was shifted to Chinsura and then to Barrackpore, West Bengal and finally established as Jute Agricultural Research Institute (JARI) at Nilganj, Barrackpore in 1953. In 1966, ICJC was taken over by Indian Council of Agricultural Research (ICAR) and the Institute was renamed as Central Research Institute for Jute and Allied Fibres (CRIJAF) in 1990.

To carry out research on jute and allied fibres, the Institute established four research stations namely Central Seed Research Station for Jute and Allied Fibres at Budbud, West Bengal (1956), Ramie Research Station, at Sorbhog, Assam (1959) Sisal Research Station, at Bamra, Odisha (1962) and Sunnhemp Research, Station at Pratapgarh, Uttar Pradesh (1963). Besides, the Institute has nine SAU based and six ICAR institute based collaborating centres for multi-locational testing and validation of the CRIJAF technologies under All India Network Projects on Jute and Allied Fibres (AINP on JAF). Two KVKs under the administrative control of ICAR-CRIJAF was established in 2006 and 2016 at Burdwan and North 24 Parganas district of West Bengal, respectively.

Administration

The Institute is headed by the Director and supported by Divisional Heads, Sectional Incharges, Senior Administrative Officer and Finance & Accounts Officer for the execution and implementation of various research activities and other programmes. The Institute Management Committee (IMC) guides and supports the Director from time to time to review of programs. The Research Advisory Committee (RAC) and Institute Research Council (IRC) provide broad guidelines and assist in developing and implementing specific research programmes and projects.

Central Seed Research Station for JAF, BudBud (W.B.)

Sunnhemp Research Station, Pratapgarh (U.P.)

Sisal Research Station, Bamra (Odisha)

Ramie Research Station, Sorbhog (Assam)

Sub-stations of ICAR-CRIJAF

Research Areas

The selected areas of research in jute and allied fibre are- breaking yield barrier, bridging the yield gap and area expansion, improving fibre quality, ecosystem services like natural resource conservation, climate change mitigation, diversification, value addition, value chain, wealth from waste, profiling of immunity-boosting bioactive compounds for medicinal use of jute and allied fibres.

Research Laboratories and Facilities

- PCR based Genotyping
- Microscopy and Histology of plant samples
- Fibre fineness and strength testing
- Bio-Informatics using NGS
- Soil and plant Testing
- Ecosystem Ecology
- Biolog based bacterial identifications
- Virus Indexing of tissue culture raised plant
- Histo-Pathological studies of plant samples
- Neutron moisture meter
- Penitrologger based soil compactness study
- Photosynthesis rate measurement
- Virtual Library through CeRA platform
- Research farms for field experiments
- Agricultural Knowledge Management Unit
- Jute and Allied Fibre Museum
- Infrastructure (Auditorium, Guest House, Canteen, Clinic, Sports facilities)

Technology Evaluation & Dissemination

All India Network Project on Jute and Allied Fibres (AINPJAF): AINPJAF is being implemented by ICAR-CRIJAF since April, 1974. At present, this project has 14 centres including 8 SAU-based and 6 ICAR-institute based collaborative centres for multi-locational evaluation of the varieties, validation of production and protection technologies and quality evaluation of the fibres.

Krishi Vigyan Kendra: KVK, Purba Bardhaman (2005) and KVK-Addl, North 24 Parganas (2016) are functioning under ICAR-CRIJAF for capacity building through training and other promotional extension activities in jute based farming system. Both KVKs are well equipped with facilities like trainee's hostel, soil testing laboratory, seed production unit and demonstration units.

Education

IARI-Kolkata Hub: ICAR-IARI, New Delhi, has recognized 16 different institutes of ICAR as IARI-Mega University Hubs. ICAR-CRIJAF is one of these hubs entrusted by IARI to initiate UG/PG/PhD teaching in agriculture. In this session, ICAR-CRIJAF is going to offer 25 seats for UG, 11 seats for PG, (Plant Breeding-3, and Soil Science-4, Agronomy -2 and Molecular Biology and Biotechnology - 2) and 5 seats for PhD (Plant Breeding-1 and Soil Science-2, and Molecular Biology and Biotechnology - 2). ICAR-CRIJAF, Kolkata hub is going to introduce these programs in association with 8 sister ICAR institutes, namely, ICAR-CIFRI, Barrackpore; ICAR-NINFET, Kolkata; ICAR-NBSSLUP, Kolkata Centre; ICAR-CSSRI, Canning Town Centre; ICAR-NDRI, Kalyani Centre; ICAR-IVRI, Kolkata; ICAR-CIFA, Rahara Centre; and ICAR-CIFE, Kolkata Centre, as hub partners.

Regional Centre of National Agricultural Education Accreditation Board: On recommendation of the accreditation board of ICAR, this institute (ICAR-CRIJAF) has been selected as the nodal centre for eastern and north-eastern region for facilitating the submission of self-study reports (SSRs) of the agricultural universities, colleges and other modalities required for accreditation.

Human Resource Development Cell: The institute has been recognized for research work for M.Sc and Ph.D programmes by the Presidency University, Calcutta University, R.K.M. Vivekananda University and Adamas University. Besides, the cell also

conducts short term summer training for M.Sc students of SAUs and general universities. HRD cell develop the year wise training schedule for all categories of staff and monitor training programmes.

Management Unit

Agricultural Knowledge Management Unit (AKMU): AKMU facilitates the infrastructure for e-governance, manages research information and provides a stable internet facility. The unit is responsible for maintenance and updating of the institute website, operating the e-extension, mobile advisory, agro-advisory services and other activities

Institute Technology Management Unit (ITMU): ITMU deals with protection of intellectual properties (IPs), their maintenance and commercialization of the technologies developed by the institute. It also looks after consultancy, contract research, patents, technology protection protocols, licensing etc.

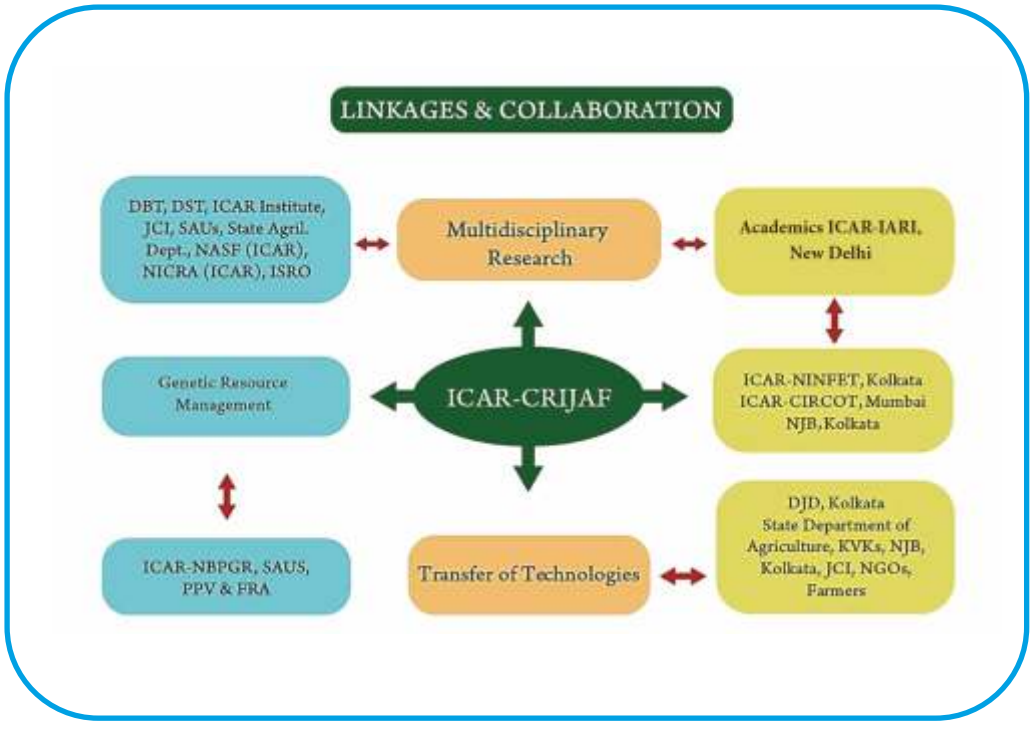
Management Cell

Prioritization, Monitoring and Evaluation (PME) Cell: PME of the Institute is working as "Single window" system for priority setting, research monitoring and evaluation, maintenance of databases related to projects, achievements, technologies developed, publication etc. PME cell coordinates in maintaining the information and documentation of all the in-house as well as externally funded projects.

Women Cell: The institute women cell addresses the issues related to grievances of women employees. This cell also organizes awareness programmes for the women for enhancing their income and the management of family and welfare of the society.

Linkages

The research programs are partly supported by grants-in-aid from the DBT, ISRO, NASF, SRD, NICRA, NJB, DST, and RKVY for extra-mural projects. Besides, collaborative programs are also conducted with SAUs, DJD, NINFET, JCI, NJB, PPV and FRA. The International organization like BJRI, Bangladesh is associated for R & D activities.



Unified Budget of ICAR-CRIJAF

Unified Budget of ICAR-CRIJAF for the year 2024

S. No.	Sub-Head	BE 2024-25	RE 2024-25 (Proposed)	Actual (in lakh) Expenditure (Apr-Dec 2024)
A)	GRANT FOR CREATION OF CAPITAL ASSETS (CAPITAL)			
1	Works - Office Building	57.50	46.00	15.81
2	Equipment	75.00	90.00	61.02
3	Information Technology	11.50	8.00	25.84
4	Furniture & Fixtures	10.00	10.00	6.01
5	Others	33.00	33.00	2.92
	Sub-Total (A)	**187.00**	**187.00**	**111.60**
B)	GRANTS IN AIDS- SALARIES (REVENUE)			
1	Establishment Expenses - Salaries	2600.00	2633.00	2188.00
	Sub-Total (B)	**2600.00**	**2633.00**	**2188.00**
1	Pension & Other Retirement Benefits	312.00	339.00	272.01
2	Travelling Allowances	20.00	25.00	15.88
3	Research & Operational Expenses	290.00	270.00	217.85
4	Administrative Expenses	343.70	371.00	279.46
5	Miscellaneous Expenses (HRD & Others)	73.00	60.70	38.01
	Sub-Total (C)	**1038.70**	**1065.70**	**823.21**
D)	TSP			
1	Capital	0.00	0.00	0.00
2	Revenue	33.00	33.00	13.88
	Sub-Total (D)	**33.00**	**33.00**	**13.88**
E)	NEH			
1	Capital	0.00	0.00	0.00
2	Revenue	82.80	82.20	36.17
	Sub-Total (E)	**82.80**	**82.20**	**36.17**
F)	SCSP			
1	Capital	48.00	48.00	4.11
2	Revenue	73.00	73.00	54.22
	Sub-Total (F)	**121.00**	**121.00**	**58.33**
GRAND TOTAL (A+B+C+D+E+F)		**4062.50**	**4122.50**	**3231.22**

Financial Statement of AINPJAF and KVKs

Head	Target (B.E.)	Achievement (Apr-Dec 2024)
AINPJAF	537.00	236.87
KVK, Purba Bardhaman	236.40	196.89
KVK, North 24 Parganas (Addl)	182.98	137.91

REVENUE Generated upto December 2024

ICAR-CRIJAF Head Quarter, Barrackpore	CSRSJAF, Budbud	Ramie Research Station, Sorbhog	Sisal Research Station, Bamra	Sunnhemp Research Station, Pratapgarh	Total	Target
63.80	15.67	0.18	4.17	2.11	85.93	95.00

Staff Position

Position	Sanctioned	Filled	Vacant
Director (R.M.P.)	01	01	00
Head of Divisions	03	03	00
Principal Scientist	02	02	00
Senior Scientists	10	08	02
Scientists	40	26	14
Technical Officers / Technical Assistants	108	59	49
Sr. Administrative Officer	01	00	01
Finance and Accounts Officer	01	01	00
Administrative Officer	02	01	01
Assistant & Administrative Officer	07	07	00
Private Secretary	01	01	00
Personal Assistants	02	02	00
Assistants	18	12	06
Upper Divisional Clerks (UDC)	04	04	00
Lower Divisional Clerks (LDC)	05	02	03
Skilled Support Staff	46	16	30
Grand Total	**251**	**145**	**106**

CROP IMPROVEMENT

Overview

Jute and allied fibres (JAF) are important commercial crops all over the world, particularly in India. Maintaining low lignin and fibre fineness is becoming increasingly crucial for crop improvement in the face of changing climate, abiotic stress, new pathogens, drought, and water logging conditions. Germplasm from various agro-ecological and diversity-rich areas of India and abroad has been introduced through national and international efforts. The Division of Crop Improvement is successfully utilising these germplasm in breeding programs to improve the yield and quality of these natural fibres. It also serves as India's National Active Germplasm Site (NAGS) for jute and allied fibre crops. To improve the efficiency of varietal development, the Division has been regularly improving its research programmes, keeping in mind new breakthroughs in crop breeding and biotechnology.

Priorities & Thrust Areas

- Collection, characterization, evaluation, conservation and utilization of JAF germplasm
- Development of new varieties of JAF crops with high yielding potential, improved fibre quality with biotic and abiotic stress resistance through advanced breeding strategies
- Genetic enhancement in traits of economic importance through pre-breeding and molecular breeding
- Increasing breeding efficiency through genomic and transcriptomic interventions
- Production of breeder and nucleus seed of all the released varieties of JAF crops for indenters

Research Highlights (2024)

- Release of a new white jute variety JRC 9 (Namita) that demonstrates high tolerance to diseases, pests and waterlogging while providing superior fiber yield and quality.
- Genome editing techniques using CRISPR/Cas are being explored to reduce lignin content in jute fiber, enhance herbicide resistance, and prevent premature flowering by modifying the pRGEB31 vector for *Corchorus olitorius*.
- Researchers identified 30 jute-specific Intron Linked Polymorphic (ILP) markers from contrasting parents WCIN 183A and OIN456 that can aid in marker-assisted selection.
- 170 jute Resistance Gene Analogs (RGAs) containing NBARC domains were uncovered as a valuable resource for disease resistance breeding.
- Interspecific crosses between *C. capsularis* and *C. olitorius* (CAPOLI jute) demonstrated yield improvements as high as 62-74% over the parent lines, along with more compact and denser fiber cellulose bodies.
- Substantial quantities of breeder and certified seeds of multiple jute varieties and related fiber crops like sunnhemp and flax were produced to support commercial cultivation.

1.Biotechnological Intervention

1.1 Enhancing climate resilience and ensuring food security with genome editing tools

S. Datta, D. Saha, P. Satya and G. Kar

Project Code: ICAR-GEd Project, ICAR (CS) Sub-scheme 10

The project was sanctioned on 20/03/2024 as a Sub-Scheme of the ICAR Central Sector Scheme "Crop Science for Food and Nutritional Security" with a budget of Rs. 776.83 lakhs. For fast-tracking the development of jute and flax varieties with improved yield, fibre quality and climate resilience by using genome editing, genes have been identified. Guide RNA designing, and cloning is currently undergoing. Chemicals and plasticware have been purchased. Lab renovation is under progress.

A. Modifications of vectors for genome editing: The CRISPR/Cas vector to be used for genome editing in jute (*Corchorus olitorius*) and flax (*Linum usitatissimum*) was designed by modification of pRGEB31(Addgene #51295). The pRGEB31 has a monocot-specific constitutive promoter OsU3 whereas the target organisms, jute and flax are dicotyledonous. Hence, to efficiently drive the expression of gRNA, replacing the OsU3 promoter with a dicot-specific promoter, such as *Arabidopsis thaliana* U6 promoter would be appropriate. For modification, synthetic DNA oligonucleotide (pAtU6-gRNA scaffold) flanking with HindIII and SbfI restriction site at both ends was designed. The AtU6 promoter sequence was derived from pCHIMERA (Addgene #61476). Few additional nucleotides were added to both the ends of synthetic DNA oligonucleotide according to the preference that restriction endonucleases have for the number of bases flanking their recognition sequences. The gRNA for target gene is to be inserted at BsaI site in between AtU6 promoter and gRNA scaffold. The schematic representation of the modified pRGEB31 vector with the *Arabidopsis* U6 promoter driving gRNA expression is shown in the figure (Fig. 1) below.

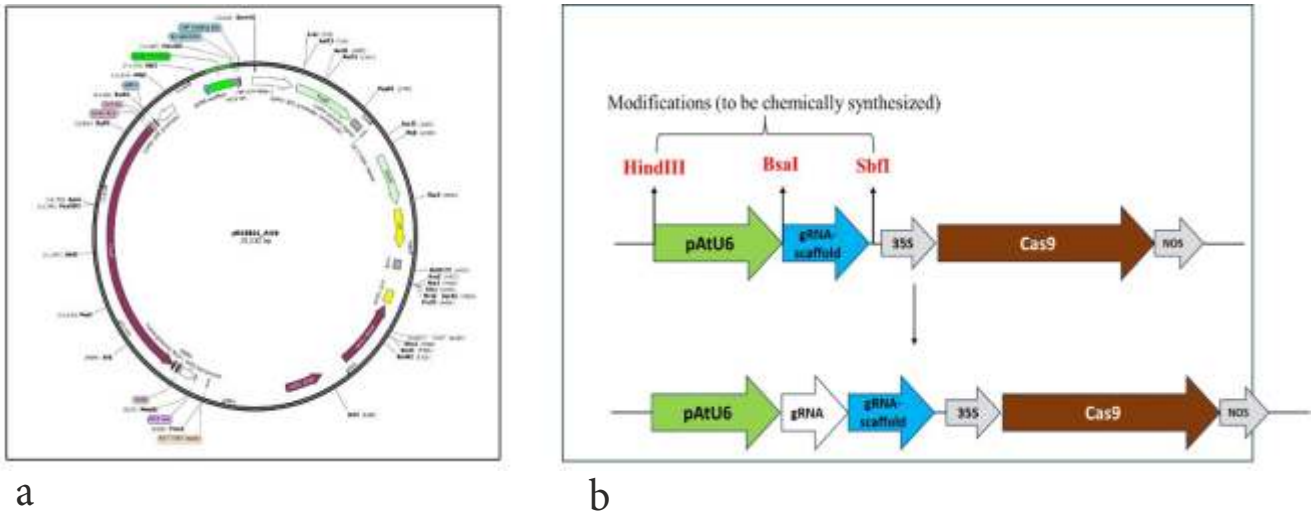


Fig. 1. Repurposing of CRISPR-Cas 9 vector system. (a) Modified pRGEB31 with dicot-specific AtU6 promoter replacing monocot-specific OsU3 promoter and (b) Schematic representation of insertion of gRNA of target gene in the vector

B. Selection of genes and guide RNA design: Guide RNA (gRNA) designing is crucial for the accuracy and efficiency of CRISPR-Cas9 genome editing technique. A gRNA typically consists of a target-specific 20-nucleotide sequence and a scaffold region that binds to Cas9, directing it to induce a double-strand break near a PAM sequence (e.g., NGG). Effective design minimizes off-target effects while ensuring high on-target efficiency. The gRNA sequence dictates where Cas9 will induce a double-strand break (DSB) in the DNA, initiating the editing process through either non-homologous end joining (NHEJ) or homology-directed repair (HDR).

For the enhancement of jute traits, three aspects had been finalized. a) Fibre quality improvement, b) Improvement of herbicide resistance, c) Prevention of early flowering in jute. Towards quality improvement of jute fibres with lower lignin content, few key genes from lignin biosynthesis pathway had been targeted. Both single copy gene family and multicopy gene families were selected and finalized for gRNA design. Query sequences were obtained from TAIR for (Fig. 2) *Arabidopsis thaliana* and PLAZA Dicot 5 database for *C. olitorius*, O-4 cultivar (Assembly name: COLO4_1.0). Using these sequence BLASTN was run against *C. olitorius*, JRO-524 cultivar (Assembly name: Co_S7_2014) and sequences of the finalized genes were obtained. Multiple sequence alignment using Clustal Omega was done between the obtained genes for identifying unique regions. One representation of Ferrulate-5-hydroxylase (F5H) gene had been shown in Fig.3.

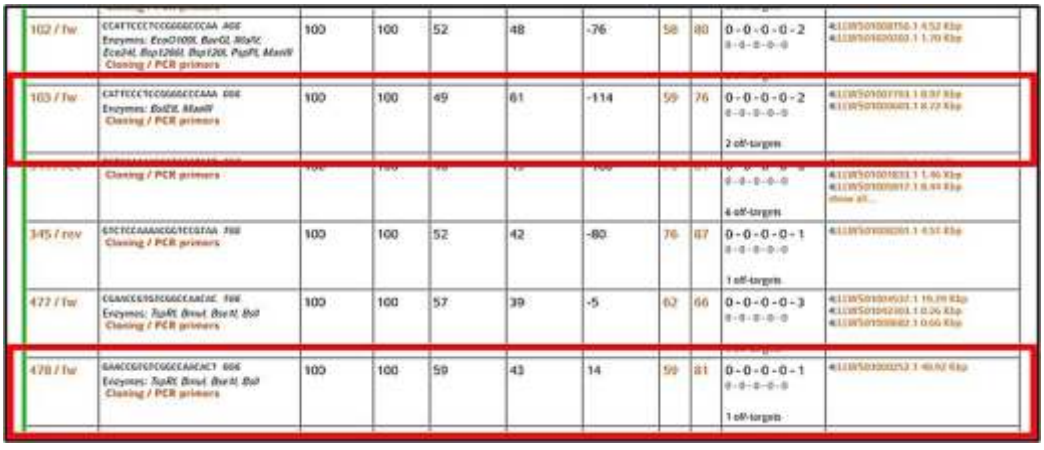


Fig. 2. Selection and design of gRNA from *C. olitorius*

Fig. 3. Multiple sequence alignment of F5H gene sequences from *A. thaliana* and *C. olitorius*

For the designing of gRNA, the genome sequence assembly of JRO-524 Co_S7_2014 was added to CRISPOR database. From the finalized genes, gRNA had been designed from first two exons of both genes in CRISPOR. Guide RNAs were designed for a total of 12 genes. One representation from F5H gene is shown Fig.3. gRNAs with minimum off-targets and forward orientation were selected.

C. Nanoparticle mediated modulation of *in vitro* regeneration in flax: Nanoparticles are tiny particles with outer dimensions ranging between 1 and 100 nanometers. They have many potential applications in research, but the knowledge about the possible effects of nanoparticles in plant regeneration is limited. Seeds of flax variety JRF2 were used as starting material. 0.02% Bavistin (20 minutes), Mercuric Chloride (5-7 minutes), and 70% ethanol (1 minute) were used to sterilize seeds and then washed thoroughly with autoclaved distilled water and placed on one-fourth strength MS medium for germination. Seven day old hypocotyls were used as explants for further experiments. The experiments were conducted using MS basal medium augmented with 2,4-D (1 mg/L) and kinetin (0.5 mg/L) and three different concentrations of AgNP (25 µg/L,50 µg/L,100 µg/L) were used (Fig.4). The medium was supplemented with sucrose (3%) and casein hydrolysate (300 mg/L) and then solidified with gelrite (4.4 g/L). Explants (hypocotyls) were cut into pieces (0.5 -1 cm) and placed on the media as mentioned earlier for 48 hrs. After 48 hrs, the explants were placed in callus induction media. All cultures were kept in the culture room maintaining photoperiod (16 light/8 dark hours) and temperature (25°C).

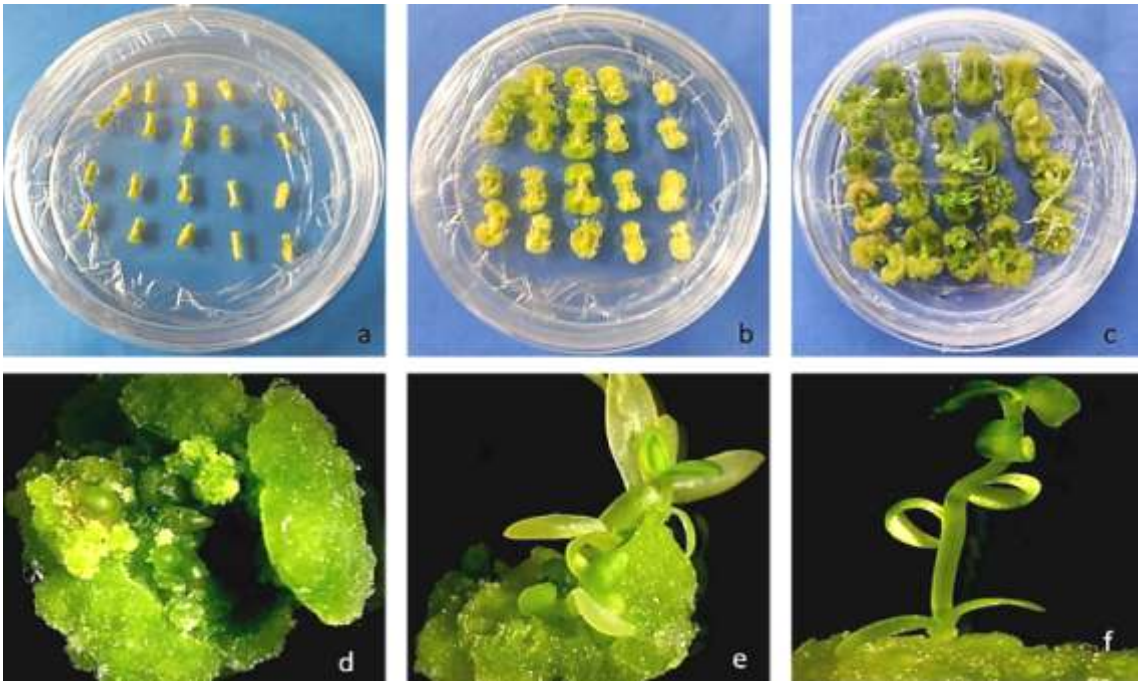


Fig. 4. Callus tissue formation in MS media augmented with 2,4-D, kinetin, and AgNP, a) Hypocotyls after 15 days of culture with relatively low callus growth; b) Hypocotyls after 30 days of culture covered with a heterogeneous callus tissue; c) Hypocotyls after 50 days of culture with a shoot; d) Hypocotyl after 40 days of culture with shoot primordium; e-f) Hypocotyls after 55 days of culture with a shoot as seen under stereo-zoom microscope.

1.2 *In vitro* regeneration and haploidy induction in jute

S. Datta, K. Meena, K.N. Chaurasia and R. Bhowmik

Project Code: In-house project JBT 4.9

A standardized *in-vitro* shoot regeneration system was developed for the jute varieties JRO 524 (*C. olitorius*) and JRC 212 (*C. capsularis*) under controlled conditions. Seeds of JRO 524 and JRC 212 were subjected to surface sterilization using 0.2% Bavistin for 8 minutes, 0.1% $HgCl_2$ for 10 minutes and 70% ethanol for 1 minute to minimize contamination. Seven-day-old hypocotyls of JRO 524 seedlings and four-day-old hypocotyls and cotyledonary leaves of JRC 212 seedlings were used as explants. In JRO 524, hypocotyl explants demonstrated notable regeneration potential, forming callus and regenerating shoots on SM3 and SM. In JRC 212, the hypocotyl and cotyledonary leaves displayed significant swelling and bulging on ASRM medium, indicating a higher responsiveness to regeneration conditions. In contrast, explants on SM3 medium showed a different response; while the hypocotyls exhibited bulging and root development, the cotyledonary leaves expanded without any noticeable swelling (Fig.5 & 6).

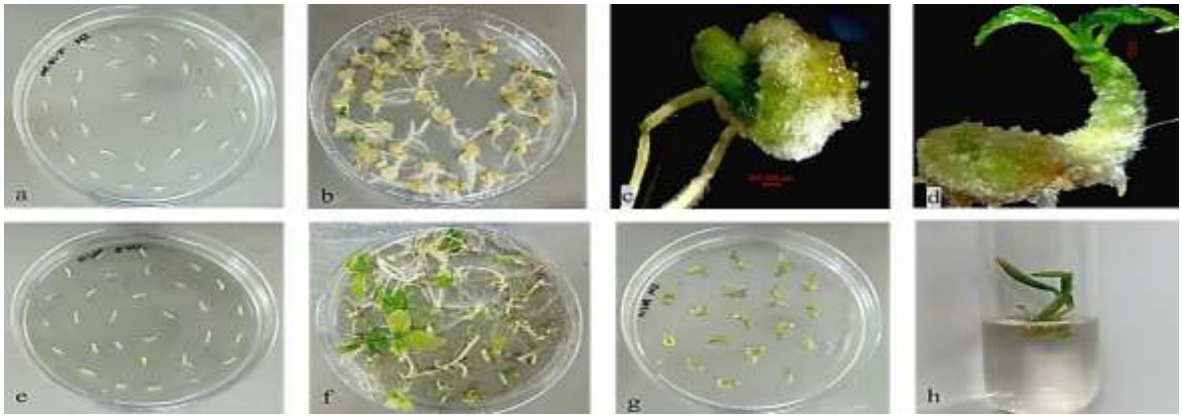


Fig. 5. Stages of *in vitro* culture and regeneration of *C. olitorius* JRO 524, (a) Hypocotyls (~1 cm) excised and inoculated on SM medium. (b) Cell swelling observed in hypocotyls after 30 days on SM medium. (c) Stereo microscope (0.63X) view showing callus formation on JRO 524 hypocotyls cultured on SM3 medium. (d) Stereo microscope (0.63X) view showing plant regeneration from callus on SM medium. (e) Hypocotyls (~1 cm) inoculated on SM3 medium. (f) Plants observed after 20 days on SM3 medium. (g) Roots removed, and plants re-inoculated on SM3 medium. (h) Regenerated plant transferred to SM medium for further growth.

Fig. 6. Stages of in vitro culture and regeneration of *C. capsularis* JRC 212. (a) JRC 212 seeds inoculated on a sterile wet tissue paper bed instead of agar-supported germination media. (b) Four-day-old JRC 212 seedlings. (c, d) Hypocotyls and cotyledonary leaves of JRC 212 inoculated on ASRM medium. (e, g) Well-developed hypocotyls and cotyledonary leaves on ASRM medium. (f, h) Enlarged views of hypocotyls and cotyledonary leaves on ASRM medium showing green callus formation.

1.3 Molecular mapping for stem rot resistance in jute (*Corchorous sp.*)

K. Meena, K. Mandal, S. Dutta and Thribhuvan R.

Project Code: In-house project JBT 5.0

Stem rot disease poses a significant threat to jute cultivation, leading to considerable losses. Managing this disease in field conditions is challenging due to its complex nature. Identifying resistant sources and understanding genetic inheritance are crucial steps toward addressing this issue. Thus, approximately 250 individual F_2 seeds from a population derived from two contrasting parents, P_1 (resistant, WCIN 183A) and P_2 (susceptible, OIN456), were sown for generation advancement. Genomic DNA was isolated using the CTAB method from 220 germinated plants and the two parents 30 days after sowing. The DNA was isolated, purified, quantified, and used in Polymerase Chain Reaction (PCR). The DNA was used to screen 99 jute-specific Intron Linked Polymorphic (ILP) markers for parental polymorphism. The PCR amplification conditions were as follows: an initial denaturation at 95°C for 5m, followed by 35 cycles of denaturation at 95°C for 45s, annealing at 57°C for 45s, and extension at 72°C for 1m, and a final extension at 72°C for 10m (Fig.7 & 8).

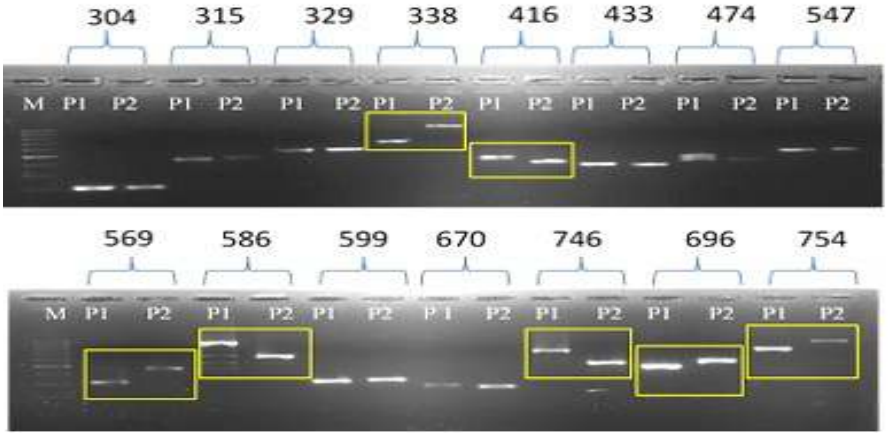


Fig. 7. Representative figure showing parental polymorphism with different ILP markers; Legends: L: 100 bp ladder; 1-15: profile of two parents with different ILP markers

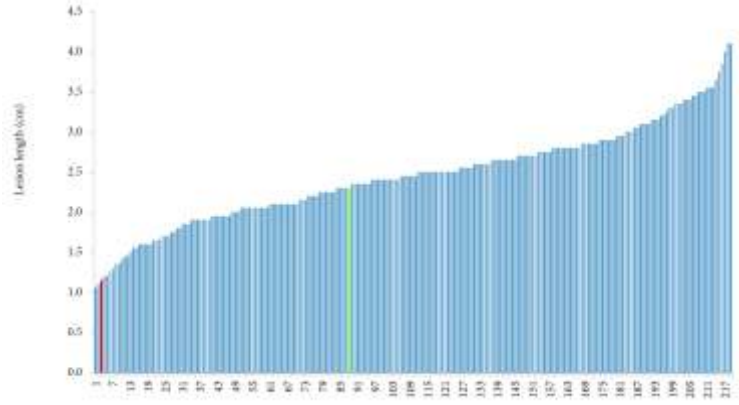


Fig. 8. Showing discrimination of segregating population into resistant and susceptible

The amplified products were separated on a 3 % agarose gel containing ethidium bromide and photographed using a gel documentation system. The amplification success was 95.9%, with 10.5% of the primers showing amplification in either of the parents and 4.2% showing no amplification. Approximately 30 markers displayed polymorphism, with a representative figure showing parental polymorphism with ILP markers (Fig. 7). A non-destructive *in vitro* method was used to screen the segregating F_2 population (219 plants) and the parents for disease resistance. The plants were inoculated with a virulent isolate of *M. phaseolina,* and lesion lengths were measured after two days. Based on the lesion length data, the population was categorized into susceptible and resistant groups (Fig. 8). Additionally, to identify new marker systems in jute, 170 Resistance Gene Analogs (RGAs) containing NBARC domains were identified from the jute genome. Among these, 157 were located on chromosomes, and 13 were found in scaffolds (Fig. 9).

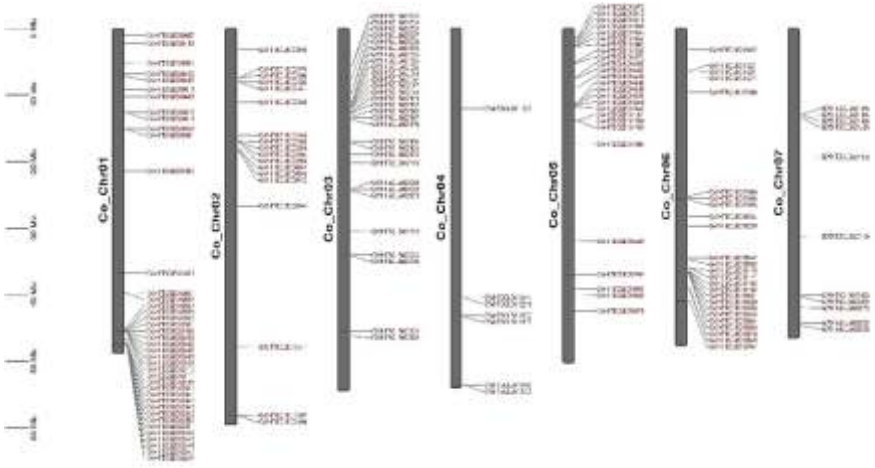


Fig. 9. Distribution of RGAs across the chromosome

1.4 Histological basis for bast fibre yield improvement in CAPOLI jute

N.A. Mandal, P. Satya, B. Adhikary, N.K. Singh and D. Sarkar

Project code: ICAR-NPFGGM-3070

Based on three years' successive field trials–laid out in an -lattice–under long-day summer conditions, the CAPOLI (*C. capsularis* *C. olitorius*) jute showed phenomenal yield improvement as high as 62 and 74 % over their founders JRO-524 (*C. olitorius*) and JRC-212 (*C. capsularis*), respectively (Table 1). When the pooled data were fitted into a mixed-effects model (REML/ BLUP), the results showed that the genotypic effects on fibre yield and stem-base diameter were consistent over the years (Table 2). Of the three traits, fibre yield had the highest (78.1 %) and stem-base diameter (45.4 %) the lowest heritability on an entry mean basis. However, fibre yield had higher phenotypic correlation with plant height (0.771) than that with stem-base diameter (0.592).

Table 1. Bast fibre yield (g/plant) improvement in a few representative CAPOLI jute lines over their two founders pooled over three years (2021-2023)

CAPOLI[a]	FY[b]	BLUP[b]	% over JRC-212	% over JRO-524
SAMN27065784	28.1	26.1	73.8	61.6
SAMN27065729	26.8	25.2	65.9	54.2
SAMN27065792	26.7	25.0	65.5	53.9
SAMN27065770	26.4	24.8	63.4	51.9
SAMN27065718	26.4	24.8	63.2	51.7
SAMN27065736	26.3	24.8	62.9	51.4

[a]NCBI BioSample accessions; [b]FY, fibre yield; BLUP, best linear unbiased prediction

Maximum (0.884) and minimum (0.673) selective accuracy were observed for fibre yield and stem-base diameter, respectively.

Table 2. P-values for likelihood ratio test of the analyzed traits across 194 CAPOLI lines pooled over three years

Model [a]	PH [b]	SBD[b]	FY [b]
GEN	3.44e -10	1.31e -06	1.71e -42
BLOCK(ENV:REP)	1.05e -06	7.04e -05	2.08e -01
GEN:ENV	2.81e -03	5.29e -01	1.00e+00

[a]Random effects: GEN, BLOCK(ENV:REP), GEN:ENV; fixed effects: ENV, REP(ENV); denominator DF: Satterthwaite's method; [b]PH, plant height; SBD, stem-base diameter; FY, fibre yield

In order to establish a histological basis for bast fibre yield increment in CAPOLI jute, fibre content was estimated in comparison to that of its two founders, according to Kundu et al. 2012 (Plant Growth Regul 67: 45-55). The results are shown in Table 3. Of the three parameters affecting fibre content in jute, F_R (the mean ratio of the total number of fibre cell bundles (FCBs) in a wedge to their number in the first FCB layer nearest the cambium) did not have any significant (P 0.05) difference between the CAPOLI jute and its two founders (Table 3).

Table 3. Parameters of fibre cell bundle and fibre content in the transversal sections of the lower stem segments of CAPOLI jute and its two corresponding founders

Genotype[a]	FR[b]	F_C	F_T (F_R´ F_C)[c]
JRC -212	7.62 a	487.33 b	3710.47 b
JRO -524	6.98 a	662.33 a	4621.70 a
CAPOLI	6.99 a	677.00 a	4728.90 a

[a]CAPOLI line BioSample SAMN27065784 used for histology; [b]As expanded in the text; [c]Means with common letters are not significantly different at P 0.05, according to post-hoc Tukey's Honestly Significant Difference (HSD) test

On an average, *C. capsularis* (JRC-212) had significantly (P 0.05) lower values of both F_c (the total number of FCBs in the first FCB layer nearest the cambium in the entire transversal section over all the FCB wedges) and F_T (fibre content; see Table 3) than that of *C. olitorius* (JRO-524) and CAPOLI jute. Interestingly, however, there were no significant (P 0.05) differences in F_c and F_T between *C. olitorius* and CAPOLI jute. This result could thus not provide a histological support for bast fibre yield improvement in CAPOLI jute in terms of fibre content (F_T).

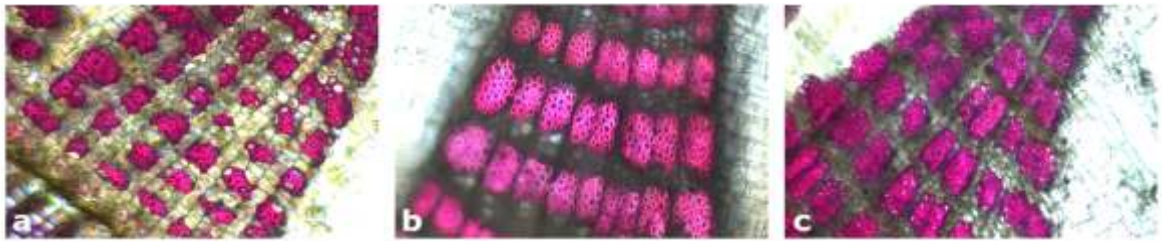


Fig. 10. Maüle ($KMnO_4$-HCl)-stained transversal sections (100) of the lower stem segments of *C. capsularis* cv. JRC-212 **(a)**, CAPOLI line SAMN27065784 **(b)**, and *C. olitorius* cv. JRO-524 **(c)**.

On closer examinations of the transversal sections of the lower stem segments, the CAPOLI jute was found to be characterized by more compact and denser FCBs (Fig. 10b)—with considerably higher number of ultimate fibre cells per FCB—as compared to both *C. capsularis* (Fig. 1a) and *C. olitorius* (Fig. 10c). The FCB-compactness has long been thought as one of the key anatomical features governing bast fibre yield in jute (see BC Kundu's and RK Maiti's works circa 1954-1997). For the current algorithm that estimates fibre content in jute (see above) does not entail the parameter FCB-compactness, it is not entirely unlikely as to why fibre content could not provide a histological support for a very significant fibre yield increment in CAPOLI jute as compared to *C. olitorius*. In the future, a robust algorithm based on machine learning should be developed and trained, with an objective to estimate jute fibre content vis-à-vis yield by artificial intelligence for high-throughput screening of breeding lines or germplasm.

1.5 Functional analysis of selected heat-responsive transcription factor genes through genome editing in flax cv. JRF-2

D. Saha, S. Datta and A. K. Panda

Project code: SERB CRG/2021/001317

The growth of flax plants, seed maturation, and bast fibre formation are significantly impacted by the high-temperature stress exposure at the later stages of plant growth owing to oxidative cell damage. Our prior research identified two transcription factor-coding genes of Heat Shock Factors (HSFs), such as LuHSFA2a and LuHSFA2b, and a NAC-domain TF, LuNAC003, from the flax genome, which regulates high-temperature stress response. A detailed functional analysis of these three genes was conducted by overexpression in the model plant, *Arabidopsis thaliana* (Columbia ecotype), and by genome editing in the flax cultivar, JRF-2. The overexpression vector constructs of LuHSFA2a, LuHSFA2b, and LuNAC003 in the plant binary plasmid pCAMBIA1301 were previously developed for the purpose. Similarly, we cloned the genome editing vector constructs with single guide RNA (sgRNA) sequences targeting the aforementioned three genes into the pRGEB31 plasmid.

The three overexpression plasmid constructs in the *Agrobacterium* strain GV3101 are being used for the genetic transformation of *A. thaliana* plants using the standardized floral dip method. The siliques were allowed to develop and mature. A total of 66, 47, and 72 wild-type (Col-0) Arabidopsis plants were transformed with the three constructs, respectively. The seeds from T_0 plants are being selected on MS media supplemented with hygromycin (25 mg/l) for the selection of T_1 plants. On the other hand, the three genome editing plasmid constructs in Agrobacterium are being used for the genetic transformation of flax hypocotyl tissues by the Agrobacterium co-cultivation method, standardized earlier in flax cv. JRF-2. The total number of calli used in the transformation included 51 for the LuHASFA2a gene, 143 for the LuHSFA2b gene, and 53 for the LuNAC003. All transformed calli were cultured on plates containing 40 mg/L hygromycin for the selection of positively transformed calli. So far, a total of 9, 29, and 5 calli, respectively, have successfully undergone selection and produced a green organogenic calli mass. The selected calli were multiplied and are in the process of regenerating green shoots.

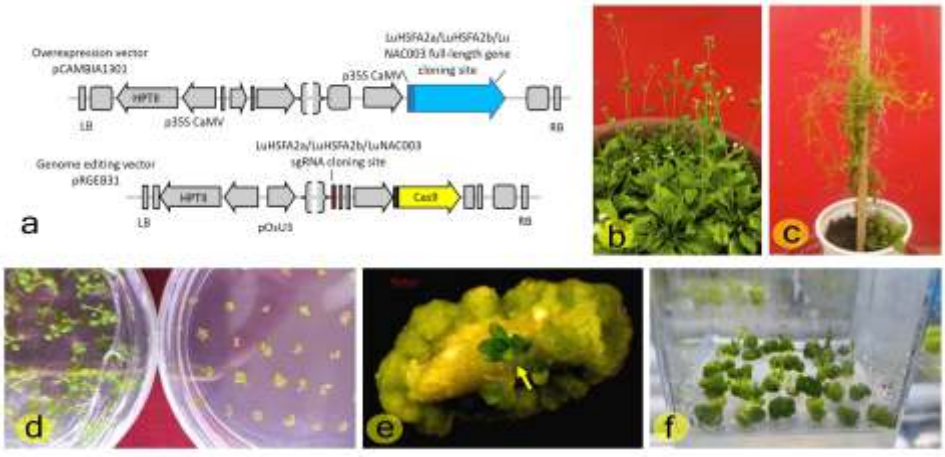


Fig. 11. Genetic transformations of *Arabidopsis* and fibre flax cv. JRF-2. (a) Schematic diagram of plant transformation vector, pCAMBIA1301, harbouring full-length LuHSFA2a, LuHSFA2b, or LuNAC003 genes for overexpression studies in *Arabidopsis thaliana*. The diagram of genome editing vector, pRGEB31, consisting of sgRNA sequences targeting LuHSFA2a, LuHSFA2b, or LuNAC003 genes were also depicted, (b-c) wild-type *A. thaliana* plants transformed with overexpression vectors; (d) selection of T_1 seeds of transformed *A. thaliana* on MS media with hygromycin (25mg/l), (e) shoot primordia developed from the hygromycin selected flax hypocotyl transformed with genome editing vectors, (f) shoot-let proliferation from flax hypocotyls on MS media.

1.6 Development of molecular marker panel for DNA fingerprinting of jute

Rakesh Bhowmick and Thribhuvan R.

Project Code: In-house Project

In recent years, a small number of superior parental lines have been often utilized in jute breeding projects, leading to limited genetic diversity in new varieties. Therefore, distinguishing amongst jute varieties based solely on morphological features is challenging. The project aimed to identify DNA fingerprints of released jute varieties which will be more accurate than that of conventional morphology based varietal identification. In order to identify polymorphic markers to distinguish jute varieties, MITE insertion polymorphism markers were developed. Whole genome survey led to identification of 51,369 candidate MITE elements in *C. capsularis* and 50,829 in *C. olitorius.* Primer pairs flanking the MITE elements were designed to develop MITE insertion polymorphism markers. The present study identified large number of genome wide distributed MITE insertion polymorphism markers and these markers can be used for jute molecular breeding, molecular diversity analysis and forward genetics based gene identification. Thirty-eight MITE insertion polymorphism markers were amplified and 16 markers were found to be polymorphic in 28 jute germplasm. Apart from novel MITE insertion polymorphism, 32 SSR markers and 5 ISSR markers were also used. Only 4 SSR markers were found to be polymorphic and 5 ISSR markers produced a total of 37 bands/alleles.

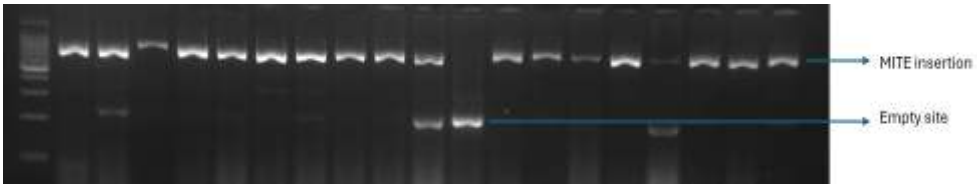


Fig. 12. Mite insertion polymorphism of marker GWHBCLC00000001|MITE|67413|67556. Upper band shows MITE insertion and lower band indicates empty site

1.7. Green technology for bioethanol from jute and kenaf

L. Sharma, P. Satya, G. Kar, Lavanya A.K., B. Majumdar, A.K. Singh and S. Ghosh

Project Code: Externally funded project-NICRA

Potential of jute as source of bioethanol was established earlier under this project. The technology generated entitled "Protocol development for production of bioethanol from whole jute biomass for climate change mitigation" was certified by ICAR on 16.07.2024. Hence, emphasis was given on green technology development. Kenaf biomass is an important lignocellulosic source for production of bioethanol. The chemical composition of dry kenaf biomass was determined. It was found that the kenaf biomass contains 57% cellulose, 18% hemicellulose and 21% lignin. An experiment was undertaken to determine the suitable pretreatment conditions for kenaf biomass. The treatments included physical pretreatment with steam, chemical pretreatments with acid and alkali, followed by enzymatic treatment achieving over 75% delignification. Untreated kenaf biomass had smoother surface, compact and rigid structure. Increased swelling of cell after pretreatment was observed that allowed higher enzyme penetration. Upon pretreatment, uneven fibrillar structure with numerous pores and fractures were observed that increased enzyme accessibility. A green technology for cellulolytic enzyme production in situ was developed for *Trichoderma resei* using various substrates. Rice straw and wheat bran were found to be better low-cost carbon substrate than carboxymethylcellulose (CMC). Jute stem, Kapok fibre and jute seed restricted cellulase production. Saccharification of jute using microbial culture resulted in production of over 500 mg of reducing sugar per gram dry biomass under optimized condition.

2. Breeding for Fibre Yield and Quality

2.1 Pre-breeding and breeding approaches for developing major biotic stress resistance in jute

J. K. Meena, K. N. Chourasia, K. Mandal and S. Satpathy

Project Code: In-house Project JB10.7

A. Best heterotic combinations for fibre yield in toss jute: Under this breeding program, 45 F_1,s were produced by hybridizing three stem rot tolerant male parents (donor parents) OIJ-161, WCIN136-1, and WCIN-179 with fifteen high-yielding parents (JROBA-3, JRO-204, JRO-2407, JROG-1, JRO-524, CO-58, S-19, TARUN, SUDHAN GREEN, CHINSURA GREEN, JROB-2, JRO-8432, JBO-1, JRO-7835, JROM-1) in a Line x Tester analysis manner. Among these F1,s only JROBA-3 × OIJ-161(26.0g/plant), JROBA-3 × WCIN-136-1 (20.0 g/plant), JROBA-3 × WCIN-179(19.75 g/plant), JRO-204 × WCIN-136-1 (11.78g/plant), and JRO-204 × WCIN-179 (5.21 g/plant) has observed as best heterotic combinations for fibre yield, making them promising candidates for improving jute production (Fig.13). These hybrids could be further advanced in the breeding program for the development of high-yielding, disease-resistant, and adaptable jute varieties.

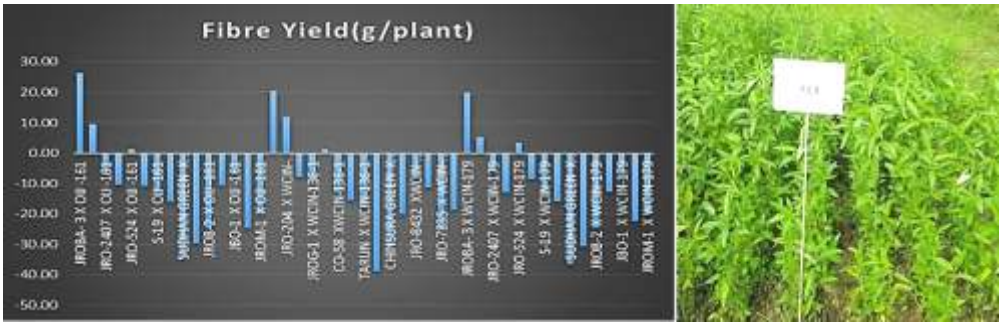


Fig.13. Heterotic combinations in tossa jute (*C. olitorius*)

B. Screening for yellow mite infestation in jute germplasms during 2023-24 season: The study aimed to evaluate the tolerance levels of 100 jute germplasm lines to mite infestation during the 2023-24 growing season, with the goal of identifying lines exhibiting superior tolerance and consistent performance across seasons. The experiment assessed mite infestation by measuring the mite population density on jute plants, expressed as the number of mites per cm^2 of leaf surface. Out of the 100 germplasm lines evaluated, 12 lines showed significantly lower mite infestation levels compared to the check variety. OIN-082 (21.33 mites/cm^2), and OEX-013 (24.66 mites/cm^2), OEX-32 (30.00 mites/cm^2), OEX-07 (40.00 mites/cm^2) and OIJ-98 (43.84 mites/cm^2) demonstrated consistent tolerance across two consecutive seasons, highlighting their potential for broader cultivation. Other lines, such as OIN-008 (29.33), OIN-016 (27.33), OIJ-136 (32.00), OIJ-254 (42.00), OIJ-253 (44.33), OIJ-229 (46.05) and OEX-013 (24.66) also displayed notable tolerance but did not perform as consistently across seasons. This analysis identifies OIJ-98, OIJ-295, OEX-007, OEX-032 and OIN-082 more consistent in performance across two season and recorded less damage the most promising germplasms for breeding programs targeting mite resistance in jute.

Stem rot screening: A field evaluation was conducted to screen 70 *C. olitorius* (tossa jute) genotypes and 10 *C. capsularis* (white jute) genotypes for resistance to

stem rot caused by *Macrophomina* spp. Among the *C. olitorius* genotypes, five exhibited tolerance to the pathogen, 15 displayed moderate tolerances, and the remaining genotypes were classified as susceptible. In the case of *C. capsularis*, five genotypes demonstrated tolerance, while the other five were categorized as susceptible under field conditions.

2.2 Maximizing fibre productivity in jute through genetic and agronomic approaches

K. N. Chourasia, J.K. Meena, J. Mitra, P. Satya, S. Sarkar, S. Mitra, S. Ghosh and R. K. De

Project Code: In-house Project JB 10.5

A. Characterization of germplasm for fibre yield and yield contributing traits: The characterization of germplasm for fibre yield in jute plays a pivotal role in breaking the yield barrier. It enables targeted breeding efforts, adaptation to changing conditions, and the development of varieties that can withstand biotic and abiotic stresses, ultimately leading to increased and sustainable jute fibre production. 92 *C. olitorious* germplasm were evaluated for fibre yield and associated traits across diverse accessions from countries like India, Kenya, Tanzania, Brazil, Nepal, and others. Indian accessions dominate the dataset, with significant contributions from regions like Andhra Pradesh, West Bengal, and Gujarat. High-performing accessions include OIN-0945, which recorded the highest green weight (555 g), and OIN-1159 with the highest dry fibre weight (44.4 g). OIJ-040 exhibited excellent plant height (440 cm), while OIJ-280 demonstrated superior basal diameter (2.28 cm). In contrast, low-performing accessions like OIN-1292 and OMU-07 showed poor green weight (60 g) and dry fibre weight (2 g), respectively. Trait correlations reveal that taller plants, higher node counts, and greater basal diameter contribute positively to fibre yield. For instance, OIJ-267, with 117 nodes, showed strong yield performance. The analysis suggests selecting high-performing accessions like OIN-0945, OIN-1159, and OIJ-280 to improve fibre yield. Focusing on traits like plant height, node count, and basal diameter can further boost yield.

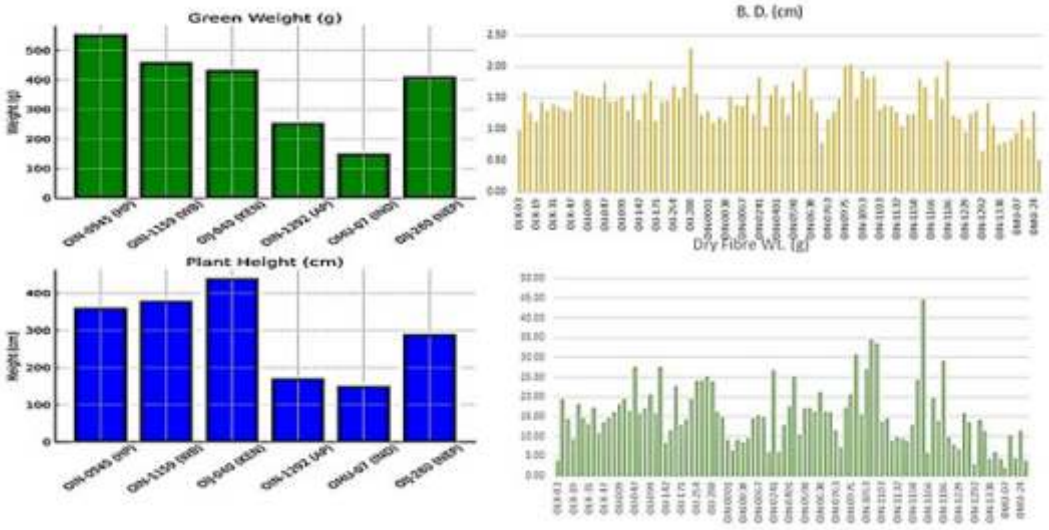


Fig. 14. Performance matrix of different genotype

B. Hybridization in jute: Continuous hybridization in jute breeding is important task for incorporation of valuable gene in elite material and to create genetic variation. JROBA3, JROBA4 and JRO 524 were used to cross 5 promising F_4 family population. In total 60 crosses were attempted and among them 43 were successful. Similarly in white jute, JRC 517, JRCP 6 and JRCP 7 were used to cross 5 promising F_4 family population.

C. Evaluation of segregating generation in jute: In *C.olitorius,* 150 single plant progenies of F_4 from ten crosses were evaluated; Table 4 provides the mean, range, and CV for important fibre-related characteristics. Plants of F_4 generation exhibited large variation for fibre yield. F_4 progenies exhibited promising traits such as stem rot resistance, non-branching and non-flowering.

Table 4. Morphological characters F_4 generation

Characters	Range	Mean	CV(%)
Plant height (cm)	295-458	368	19.1
Basal Diameter (mm)	9.3-20.1	14.8	18.5
Fibre yield/plant (gram)	07-29	17.3	22.5

D. Evaluation of 45 F_4 lines of white jute (*C. capsularis* L.) for high fibre yield: The study aimed to evaluate 45 F_4 lines of white jute (*C. capsularis* L.) for fibre yield and related traits to identify promising genotypes. Significant variability was observed among the genotypes for key traits, including plant height, basal diameter, green weight, stick yield, and fibre yield. Correlation analysis indicated a strong positive association between plant height and fibre yield. The results identified superior lines exhibiting high fibre yield potential, which can be advanced for further selection and breeding. Significant variation was observed among the 45 F_4 lines for all traits ($p < 0.05$), indicating the presence of substantial genetic diversity. The highest fibre yield (39 kg/ha) was recorded in line F_4-7, followed by F_4-38 and F_4-35, showing significant improvement over the check variety. Based on overall performance, the top five lines (F_4-38, F_4-35, F_4-1, F_4-9, and F_4-37) were identified as superior for fibre yield and agronomic traits. The observed variability among F_4 lines highlights the effectiveness of selection in early generations for fibre yield. Traits such as plant height and basal diameter were confirmed as indirect selection criteria due to their significant correlation with fibre yield. Superior lines identified in this study can serve as potential candidates for advanced trials and breeding programs. The evaluation of 45 F4 lines of white jute revealed significant genetic variability for fibre yield and related traits. F4-7, F4-38, and F4-35 demonstrated exceptional fibre yield potential, making them suitable for further breeding and large-scale evaluation.

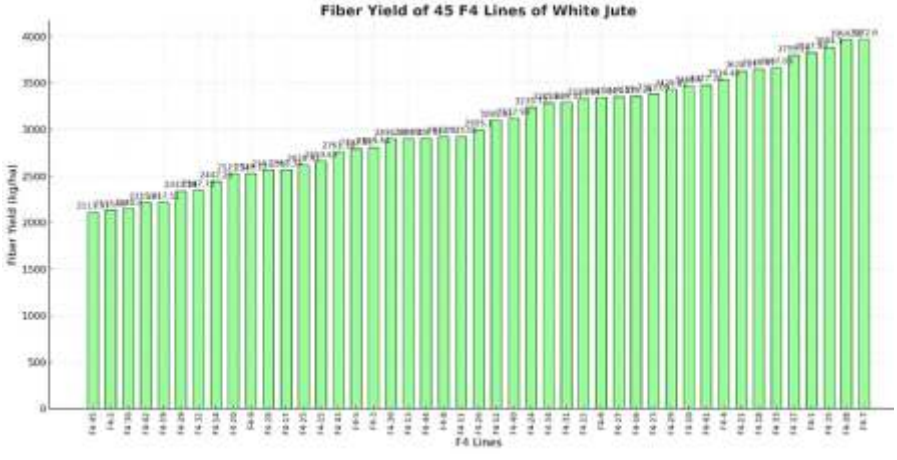


Fig. 15. Fibre yield of F_4 progenies of white jute

2.3 Chemical mutagenesis for creating variability in tossa jute (*C. olitorius*)

Thribhuvan R

Project Code: In-house Project-JB 10.9

The 50% lethal dose (LD_{50}) value for tossa jute has been established at a concentration of 1% when treated with EMS for 4 h. These findings were validated using popular tossa jute varieties, specifically JRO 524, JRO 204, and JROBA 3. In a comprehensive study involving a mutation population of JRO 524, about 891 fertile plants (M_0), were meticulously assessed for their morphological traits and harvested separately. The morphological diversity observed in the M_0 generation included significant variations such as deeply serrated leaves, variegated leaf patterns, crumpled, wavy, glossy and paper type leaf structures, and non-abscission among other distinctive characteristics. Following this initial evaluation, approximately 5000 plants from the M_1 generation, derived from the M_0 mutation population, were grown in progeny rows. These M_1 plants underwent careful and regular observations to monitor any phenotypic variations, particularly those related to yield traits. It was noted, however, that there was minimal phenotypic variation in terms of traits directly affecting yield. Additionally, a substantial bulk planting was conducted with approximately 50,000 M_1 plants. For this bulk planting, an equal quantity of seeds from each of the 891 M_0 plants was combined to ensure a comprehensive representation of the original mutation population. The M_1 plants displaying different phenotypic traits were harvested separately to facilitate further study and analysis.

2.4 White jute variety JRC-9 (NAMITA): The 100th variety of jute and allied fibre crops

P. Satya, S. K. Pandey and Suman Roy

Project Code: In-house Project-JB 10.4

White jute had premature flowering tolerance, although its productivity was not as high as the new tossa jute varieties. But it has special characters such as disease-pest resistance, waterlogging tolerance and salinity tolerance. Although fibre quality parameters of white jute varieties are suitable for manufacturing of various diversified products but their low fibre yield hinders in increasing their acreage in spite of having high premature flowering tolerance to suit early sowing window (Mid-February to Mid-April). Considering these importance, new breeding efforts were taken up to develop high yielding white jute varieties without compromising fibre quality. Newer white jute varieties with high fibre yield and fibre quality would play significant role in improving the productivity and open new avenues through diversified use of fibre. A new white jute variety, JRC 9 (Namita), developed at ICAR-Central Research Institute for Jute and Allied Fibre, Barrackpore, Kolkata may be promising to improve the area of white jute in the country due to its high fibre yield potential under changing climate scenario. It is a climate smart variety with high disease-pest and waterlogging tolerance coupled with high fibre yield and fine fibre. The variety was formally released by Hon'ble Prime Minister on 11.08.2024 as one of the 100 climate-smart crop varieties and was notified vide Gazette Notification No. S.O. 4388(E) 08.10.2024. It was registered at ICAR-NBPGR with registration no. IC 651434. JRC 9 was developed using a backcross-pedigree breeding method. The donor parent for tolerance to stem rot was CP-23, a resistant line selected from germplasm accession CIM-036. It was crossed with popular high yielding variety JRC-517. The F_1 was backcrossed to JRC 517 and pedigree selection was practiced from backcross

(BC_1F_2) population, generating a number of high yielding lines with resistance to diseases and pests. The variety JRC-9 is suitable for all the white jute growing regions of West Bengal, Odisha, Bihar, UP, Tripura and Assam. This variety can replace or supplement the cultivated capsularis variety JRC 698 or the high yielding variety JRC 517 for comparatively higher yield, disease and insect-pest resistance and better fibre quality in terms of less root content and stronger fibre. JRC 9 exhibited average productivity of 32 q/ha over diverse locations during varietal evaluation. In specific locations it produced 43.7 q/ha; hence the fibre yield potential of JRC 9 is almost comparable to that of tossa jute. Moreover, it is suitable for producing white jute fibre under waterlogged condition without compromising fibre fineness. It can increase the fibre productivity of white jute by 7-10% which will increase farmers' income by Rs. 8,000-12,000/ha (@ Rs. 4,500/quintal).

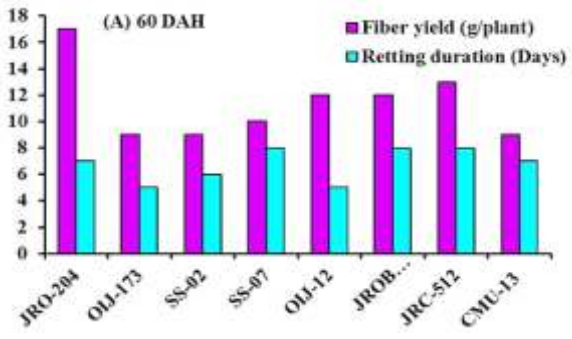
Fig 16. Field view of JRC-9 (Namita)

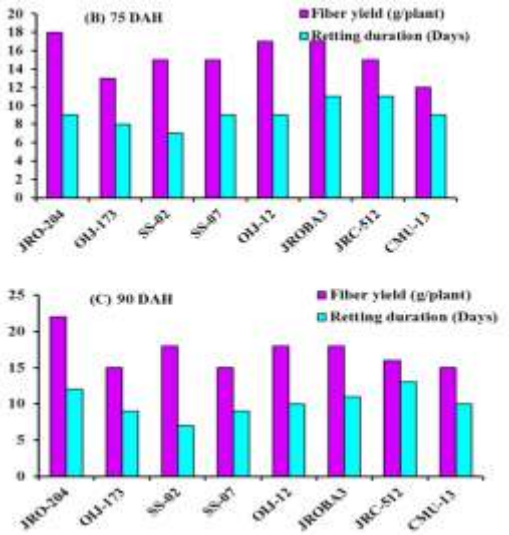
2.5 Introgression of low pectin content into high yielding jute varieties

J. K. Meena and B. Majumdar

Project Code: In-house Project- JB 10.6

Jute retting, a critical step in fibre production significantly influences yield and quality. Under this study, assessed the duration of jute retting of 18 genotypes of tossa jute (*C. olitorius*) and white jute (*C. capsularis*) harvested at five different maturity periods: 60, 75, 90, 105 and 120 days. Results revealed significant variability in retting duration based on genotype and harvesting stage (Fig. 17 A-E). Retting duration across the germplasm ranged from 5 to 16 days, with statistically significant differences among genotypes. At 60 days of harvesting, genotypes OIJ-173 and OIJ-12 exhibited the shortest retting period of 5 days among the genotypes under study.





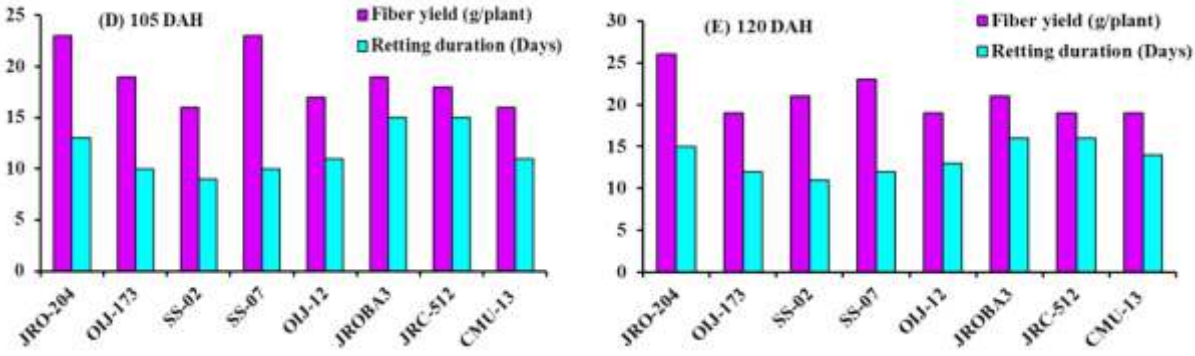


Fig. 17. Effect of retting on varieties of jute harvested at different duration

Genotype SS-02 demonstrated the shortest retting duration (7 days) at both 75 and 90 days of harvesting. At 105 days, OIJ-173 showed the shortest retting duration of 9 days. After 120 days of harvesting, tossa jute genotype SS-02 displayed the shortest retting length (11 days), while white jute genotype CMU-13 exhibited consistent retting efficiency across stages. These findings highlight the potential for selecting genotypes with shorter retting durations to enhance processing efficiency and improve fibre quality in jute production.

3. Genetic Resources and Crop Improvement

3.1 Introduction, maintenance, characterization and conservation of jute, mesta, sunnhemp, flax and ramie germplasm

J. Mitra, Thribhuvan R., S.K. Sarkar, A. Bera, R. Bhowmick and P. Divte

Project Code: In-house Project-JB 1.1

To achieve the objective of developing superior varieties, breeders require a source of genetic diversity for traits such as yield, quality, and resistance to both biotic and abiotic stresses. The artificial creation of these genetic resources is generally not feasible, except to a limited extent through mutation or genetic engineering. These resources are typically generated over extended periods through processes such as exploration, collection, evaluation, characterization, and conservation. As the National Active Germplasm Site (NAGS) for jute and allied fibre crops, ICAR-CRIJAF has consistently prioritized these activities to enhance the germplasm resources of JAF crops.

A. Conservation and maintenance

The medium-term storage facility at ICAR-CRIJAF, Barrackpore, now houses a collection of around 5950 germplasm lines of jute and associated fibres (Table 5). Around 80 Ramie germplasm lines are now being conserved in a field gene bank located at RAS, Sorbhog, Assam.

Table 5. Species wise germplasm lines conserved at ICAR-CRIJAF

Fibre crop species	No. of accessions
Cultivated species	
Corchorus olitorius L.	1840
Corchorus capsularis L.	972
Hibiscus cannabinus L.	782
Hibiscus sabdariffa L.	1057
Crotalaria juncea L.	170
Linum usitatissimum L.	260
Crop wild relatives	
Wild *Corchorus* species	613
Wild *Hibiscus* species	142
Wild *Crotalaria* species	114
Grand total	5950

B. Distribution: A total of 371 jute and allied fibres germplasm lines distributed to indenters including scientists of ICAR-CRIJAF, AINP on Jute and Allied Fibres and other institutes (Table 6).

Table 6. Species wise distribution status of JAF germplasm to indenters

Crop/species	ICAR-CRIJAF	AINP-JAF	Others/ SAU
C. olitorius	232	--	--
C. capsularis	70	--	--
Wild *Corchorus* spp.	20	--	--
Roselle	01	07	10
Mesta	20	--	--
Varieties	11	--	--
Grand total	371		

C. Regeneration: A total of 951 jute and allied fibre germplasm lines were regenerated which includes tossa jute (36), white jute (181), sunnhemp (51), Roselle (245), kenaf (230), exploration material (45), wild jute (5) and others (158).

D. Acclimatization and evaluation: A total of 782 kenaf accessions were characterized for agro-morphological descriptors and evaluated for fibre yield and associated traits. Further, 44 new germplasm accessions collected from the districts of Purulia, Jhargram, Bandoan in West Bengal and East Singhbhum district of Jharkhand were also characterized, evaluated and regenerated during this year.

E. Identification of trait specific germplasm lines

Screening for premature flowering tolerance: A total of 150 germplasm lines of *C. olitorius* were evaluated to ascertain their tolerance to premature flowering. Among these lines, about seven displayed tolerance to premature flowering, with fewer than five percent of the plants exhibiting early flowering at the February 15 sowing. The same lines demonstrated no flowering when sown on March 1, 2024. The absence of flowering in these lines when sown on March 1 indicates a strong response to environmental cues, which could be useful for managing crop timing and maximizing yield, and is crucial for improving crop resilience and productivity.

F. Screening for semilooper resistance: Laboratory experiments pertaining to the study of feeding preference, larval duration and larval survival of jute semilooper on a total of 30 wild Corchorus germplasms with 10 each belonging to *C. tridens*, *C. aestuans* and *C. pseudo-olitorius* and the cultivated *C. olitorius* (cv. JRO 204) that served as control were conducted. Two each genotype from *C. tridens* and *C. aestuans* were found to be highly tolerant and one genotype from *C. pseudo-olitorius* was found to be highly susceptible (Fig. 18).

Fig.18: Screening for semilooper resistance and susceptibility in jute

G. Development of core collection in C. olitorius: The evaluation of 1,830 accessions of *C. olitorius* was conducted for the purpose of developing a primary set of a core collection. This evaluation focused on 24 traits, which included ten qualitative and fourteen quantitative traits. It was observed that there was moderate variability in the stem, leaf, stipule, and petiole color among the accessions. Most of the accessions possessed lanceolate and ovate-lanceolate leaf shapes along with red stems.

The descriptive statistics for these 1,830 accessions are detailed in Table 7, while Table 8 and Table 9 provide the statistics for the core collection. The core set demonstrated means and ranges for characters that were like those of the primary collection, but it exhibited a higher degree of variability. The origin of the accessions was also considered as a qualitative trait in the assessment of the core collection. This inclusion was necessary due to the initially low

number of accessions in the core collection, and it was aimed at encompassing germplasm from each center of origin/collection.

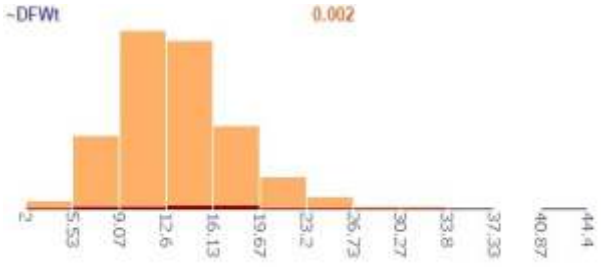


Fig. 19. Histogram exhibiting variability in dry fibre weight (g/plant) of the primary collection and the core collection.

Two distinct core collections were developed: one comprising 76 accessions (4.15%) using the M-strategy, and another consisting of 92 accessions (5.02%) developed through a random search algorithm. Notably, there were 45 accessions that were common to both sets. The core collections displayed similar means and ranges for the traits but, once again, showed greater variability than the primary collection, as illustrated in Fig.19. The coincidence rate between the core collection and the entire collection was determined to be 96.16% (using the M-strategy), indicating a high degree of resemblance between the core and the entire collection.

Table 7. Descriptive statistics of the 1,830 olitorius accessions

	Green weight (g/plant)	Plant height (cm)	Basal Diameter (cm)	Number of nodes	Stick weight (g/plant)	Fibre weight (g/plant)	1000 seed weight (g)
Mean	217.58	331.72	1.35	72.06	33.63	13.51	1.97
S.D.	68.90	40.48	0.20	11.21	12.08	4.71	0.46
Maximum	559	460	2.28	117	99.8	44.4	3.32
Minimum	49	121	0.51	31	3.2	2	0.8

Table 8. Descriptive statistics of the 76 core collection accessions (M-strategy)

	Green weight (g/plant)	Plant height (cm)	Basal Diameter (cm)	Number of nodes	Stick weight (g/plant)	Fibre weight (g/plant)	1000 seed weight (g)
Mean	236.3	324.5	1.4	72.1	36.7	15.2	1.8
S.D.	117.8	68.7	0.3	16.8	20.6	8.0	0.5
Maximum	555	440	2.28	117	99.8	44.4	3.23
Minimum	60	121	0.51	33	3.2	2	0.75

Table 9. Descriptive statistics of the 92 core collection accessions (Random search)

	Green weight (g/plant)	Plant height (cm)	Basal Diameter (cm)	Number of nodes	Stick weight (g/plant)	Fibre weight (g/plant)	1000 seed weight (g)
Mean	240.3	322.8	1.4	72.5	36.3	15.0	1.8
S.D.	115.4	65.8	0.3	15.1	19.7	7.8	0.5
Maximum	559	440	2.28	114	95.6	44.4	3.26
Minimum	60	121	0.51	38	3.2	2	0.6

3.2 Genetic enhancement of fibre quality traits in tossa jute (*Corchorus olitorius*)

Thribhuvan R., J. K. Meena, and R. K. Naik

Project Code: In-house Project-JB 10.8

A. Germplasm evaluation for fibre quality: Fifty short listed tossa jute germplasm were evaluated in replicated plots along with two checks (JRO 2407 and JRO 204) for identification of donor parents for yield and quality parameters (fibre strength and fibre fineness). The crop was harvested at 120 days of crop age. The fibre yield of the assessed germplasm ranged from 4.80g to 19.20g as against the check varieties JRO 2407 (20.3 g) and JRO 204 (21.4 g). No germplasm recorded higher yield than the best check varieties JRO 2407 and JRO 204. Fibre fineness ranged from 1.12 tex to 3.19 tex as against the check variety JRO 2407 (2.54 tex) and JRO 204 (2.62 tex). Twenty-one accessions were superior in fibre fineness than the best check variety JRO 2407. Similar trend was observed in green weight, stick weight, fibre strength of the assessed germplasm.

B. Crosses based on fibre fineness and fibre yield: Following the modest success in crossbreeding noted last year, intensified efforts have been initiated this year to achieve hybridization. The effort entailed the crossing of agronomically superior, high-yielding varieties (specifically, JRO-7835, JRO-3690, JRO-204, and JRO-2407) with selected germplasm lines recognized for their exceptional fibre quality (OIN-885, OIN-1106, OIN-923, OIN-1207, OIN-1181, OIN-1166, and OIN-1001). The selected lines and testers represent diverse genetic backgrounds, ensuring a wide range of variability for fibre quality and yield traits (Table 10). The primary goal was to produce hybrids that combine the robust growth and yield potential of the varieties with the superior fineness and quality of the germplasm lines. This focused breeding effort is expected to result in varieties with enhanced fibre characteristics suitable for both industrial applications and commercial cultivation.

Table 10. Average values of various traits in 11 tossa jute parent plants used for hybridization

Sl. No.	Line and tester	Green weight (g/plant)	Plant height (cm)	Basal diameter (cm)	Stick weight (g/plant)	Fibre weight (g/plant)	Fibre strength (g/tex)	Fibre fineness (tex)
1	OIN 0923 (Tester)	106	282	1.02	18	7.4	21.03	1.28
2	OIN 0885 (Tester)	180	317	1.27	28.2	11.4	18	1.12
3	OIN 1001 (Tester)	270	346	1.52	39	10.4	20.68	1.37
4	OIN 1106 (Tester)	165	266	1.2	26.2	8	18.2	1.19
5	OIN 1166 (Tester)	126	267	1.15	18.2	5.6	19.65	1.33
6	OIN 1181 (Tester)	276	291	1.83	52.2	15.2	22.32	1.32
7	OIN 1207 (Tester)	209	317	1.22	28.6	11	23.56	1.32
8	JRO 204 (Line)	448	392	2.44	64	21.4	26.54	2.62
9	JRO 2407 (Line)	354	368	1.89	55.1	20.3	25.08	2.54
10	JRO 7835 (Line)	423	385	2.37	54	20.1	26.83	3.41
11	JRO 3690 (Line)	472	377	2.12	60.8	19.2	28.82	3.28

3.3: Genetic improvement of flax (*Linum usitatissimum*) for higher fibre yield and fibre productivity

J. Mitra, D. Saha and K. Mandal

Project code: In-house project JB 10.3

Evaluation of F_6 lines in flax: An evaluation of 12 F_6 lines from seven cross was done during Rabi 2023-24. The mean, range and CV for important fibre-related traits are given in Table-11. Based on promising traits such as tallness, reduced axillary branches, late flowering and fibre yields, six lines were selected. Consequently a total of six lines are being evaluated in station trial with check JRF 2 in the current Rabi season 2024-25. A total of 357 germplasm lines including 90 exotic accession are under the maintenance breeding.

Table 11. Range, mean and CV % of fibre related traits in F_6 population of flax

Characters	Range	Mean	CV (%)
Pl ht (cm)	100.3 160.9	113.4± 4.7	17.50
BD (mm)	1.8 - 6.0	2.5 ± 0.15	19.2
Green wt/pl (g)	14.0-193.6	62.7 ± 5.88	21.97
Fibre yield/pl (g)	0.5-7.2	2.1 ± 0.10	23.89

Biochemical analysis for heat stress tolerance in flax: Proline and oxidized guaiacol of 32 selected F_6 flax lines of the B3 cross (EC852234 x EC852264) was estimated. Proline content is positively correlated to stress tolerance in plants by maintaining cell turgor and osmotic balance. On the other hand, the oxidized guaiacol functions as a marker for the activities of the guaiacol peroxidase enzyme (GPX), which is activated by abiotic stresses like high temperatures that produce harmful reactive oxygen species (ROS). GPX is involved in eliminating H_2O_2 in cells that serve as one of the tolerance mechanisms to plant stress. The proline content varied from 0.701 to 1.772 mg/g in B3 plant lines compared to 1.808 mg/g in JRF-2. The range of oxidized guaiacol content (mM per mg protein / min) varied from 0.129 to 0.232 in B3 plant lines, while JRF-2 showed 0.274 (Fig. 21). Previously, based on malondialdehyde (MDA) assay, JRF-2 was shown to be tolerant to heat stress-induced oxidative stress, which was further substantiated through proline content and oxidized guaiacol estimations. Some of the B3-F_6 lines exhibited comparable characteristics to JRF-2 in terms of tolerance to high-temperature-induced oxidative stress.

Fig. 20. Evaluation of F_6 progeny of flax

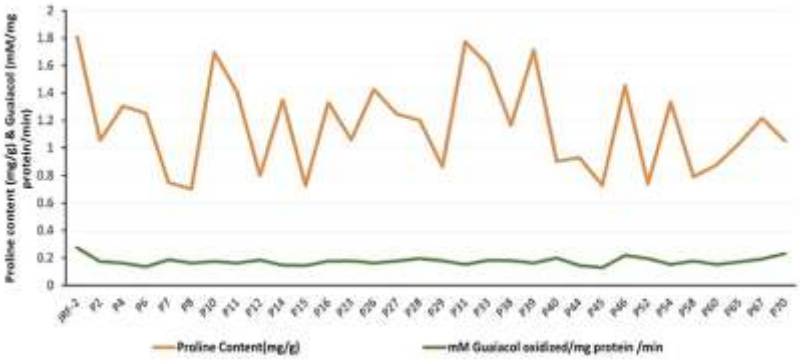


Fig. 21. Biochemical analysis of selected plant lines of F_6 progeny (P2-P70) in fibre flax for heat stress

3.4 Protection of jute varieties and DUS testing

A. Bera and C. Chattopadhyay

Project code: Externally funded project -PPVFRA

Maintenance of reference collection of jute: Ten varieties of two species of *Corchorus* i.e. *C. olitorius* (23JU05T, 23JU06T, 23JU07T, 23JU08T, 23JU09T and 23JU10T) and *C. capsularis* (23JU01T, 23JU02T, 23JU03T and 23JU04T) were tested in DUS trial during 2023-24. Sowing was done on 15.03.2023 at ICAR-CRIJAF, Barrackpore (Nodal centre) and on 23.03.2023 at ICAR-CSRSJAF, Bud Bud, West Bengal (Co-nodal centre). During entire crop growth period 17 DUS characteristics were recorded following DUS test guideline.

In both capsularis and olitorius entries plants were uniform with regard to expression of traits. In case of capsularis varieties all four (23JU01T, 23JU02T, 23JU03T and 23JU04T) were uniform in expressions of DUS characteristics. Leaf lamina colour and leaf vein colour were green and petiole colour was red in all the varieties. Most of the varieties can be distinguished on the basis of stem colour (characteristic-6). Stem colour was Coppery red in 23JU01T and 23JU04T, red in 23JU03T, purple in 23JU02T. These two varieties (23JU01T and 23JU04T) differ with respect to seed size (extra-large 3.65g in 23JU01T and large 3.41g in 23JU04T) and fibre quality (23JU01T: very fine and fairly average fibre strength; 23JU04T: coarse and fairly good fibre strength). Pigmentation of calyx was green in 23JU03T and red in 23JU01T, 23JU02T and 23JU04T. Pod pigmentation (characteristic-14) was green in 23JU03T and red in 23JU01T, 23JU02T and 23JU04T.

In case of *olitorius* varieties, plant height (characteristic-8) was medium (301-400 cm) in 23JU07T, 23JU09T and 23JU10T and tall (>400cm) in 23JU05T, 23JU06T and 23JU08T. Fibre fineness (characteristic-9) was fine (2.8-3.2 tex) in 23JU06T and 23JU08T and very fine (<2.8 tex) in 23JU05T, 23JU07T, 23JU09T and 23JU10T; whereas fibre strength (characteristic-10) was fairly good (23.5-26.4g/tex) in 23JU06T, average & weak (20.4g/tex &below) in 23JU07T, fairly average (20.5-23.4g/tex) in 23JU05T, 23JU08T, 23JU09T and 23JU10T at both the centres. Most of these varieties were distinct from each other with respect to seed color (characteristic-17) (23JU05T: black with red ridge and apex; 23JU06T: steel grey; 23JU07T: brownish grey; 23JU08T: chocolate brown; 23JU09T: black; 23JU10T: steel grey. For maintenance of reference collection of jute, thirty varieties of tossa jute, viz., JRO 204, IRA, JRO 632, JRO 3690, JRO 66, JRO 524, JRO 7835, JRO 878, JRO 8432, S-19, JRO 128, JRO 620, JRO 36 E, Chinsurah Green, Sudan Green, Tanganyika-1, JRO 2345, KOM 62, TJ 40, CO-58, JRO 2407, Tarun, JBO 1, JROG 1, NJ7010, NJ 7050, NJ 7055, Bidhan Rupali, JROM 1 and NJ 7005 and twenty one varieties of white jute, viz., JRC 212, JRC 80, JRC 698, JRC 7447, JRC 4444, Padma, JRC 321, Monalisa, UPC 94, Bidhan Pat 1, Bidhan Pat 2, Bidhan Pat 3, KC 1, KTC 1, D 154, JRC 517, JRC 532 , JBC 5, JRCM 2, KJC 7 and JRC 9057 were sown through plant to progeny row method at both ICAR-CRIJAF, Barrackpore and ICAR-CSRSJAF, Bud Bud. Database of reference collection has been prepared after recording observations of 17 essential characters.

One white jute variety JRCJ 11 has been registered for protection (date of grant of certificate-17.10.2024) after completion of DUS testing. Applications for registration of two varieties JROP 4 and JRCP 7 have been sent to the PPVFR authority and currently under DUS trial during 2024-25.

Fig. 22. Difference in stem colour in capsularis varieties

Fig. 23. Difference in seed colour in olitorius varieties

3.5 Development of DUS test guideline in kenaf and roselle

A. Bera and C. S. Kar

Project code: Externally funded project -PPVFRA

During the entire crop-growing season 2023-24, 22 characters (hypocotyl pigmentation, leaf lobing pattern, leaf vein colour, leaf petiole pigmentation, leaf collar colour, leaf pubescence, stipule colour, stem colour, stem pubescence, presence of spine on stem, stem branching habit, plant height, fibre strength, fibre fineness, flower petal colour, flower eye zone colour, flower stigma colour, fruit colour, fruit pubescence, calyx length, seed coat colour, thousand seed weight) were found to be stable and uniform in expression over the years. In Kenaf varieties, hypocotyl pigmentation was either absent (AMC-108) or present (MT-150). Plant height ranged from 3.58 m (JBMP 3) to 4.13 m (JBM 2004 D). Stem colour was either green (HC 583) or coppery red (JRHC 3). Stipule colour was either Green (JBMP 2) or Greyish reddish orange (AMC 108). Flower petal colours were white (KIN 263), creamy yellow (JRM-5) or violet (JRHC-3), whereas stigma colour was either Red (JRHC-3) or Dark red (JBMP-2) in kenaf varieties. Thousand seed weight varied between 24.60g (JRKM 9-1) to 32.11g (HC-583).

In Roselle varieties, leaf vein colour had three different states of expression i.e. green (Balijipeta Local), red (Dark red roselle) and variegated (JRR-17)). Leaf petiole pigmentation was either absent (Balijipeta local) or present (AMV-10) in roselle varieties. Leaf collar colour showed three different states of expression i.e. green (Balijipeta local), red (JRHS-1) and variegated (HS-4288). Plant height ranged from 1.95 m (Dark red roselle) to 4.35 m (AMV-2). Stem colour had four different states i.e. green (Balijipeta local), dark red (JRHS-1), variegated (HS-7910) and others (green stem with red node) (HS-4288). Stipule colour was either (HS-4288) or variegated (HS-7910). The fibre strength of roselle varieties was weak (<17 g/tex) in dark red roselle) and average 17-20.9 g/tex) in (HS 4288). Stigma colour was either pale greenish yellow (Balijipeta Local) or dark red (AMV-7) in roselle varieties. Fruit colour showed four different states of expression i.e. green (Balijipeta local), red (HS-7910), dark red (Dark red roselle) and variegated (HS 4288). Seed colour was greyish brown in RIJ 030 or brown in AMV 8. Draft DUS test guideline was prepared considering these 22 characters. Draft DUS test guidelines was presented at taskforce committee meeting held on 18.12.2023. DUS test guidelines was finalized incorporating all the suggestion received from taskforce committee members and submitted to the PPVFR Authority for consideration on 25.01.2024. Seeds of all varieties/lines have been multiplied for sowing in the upcoming season.

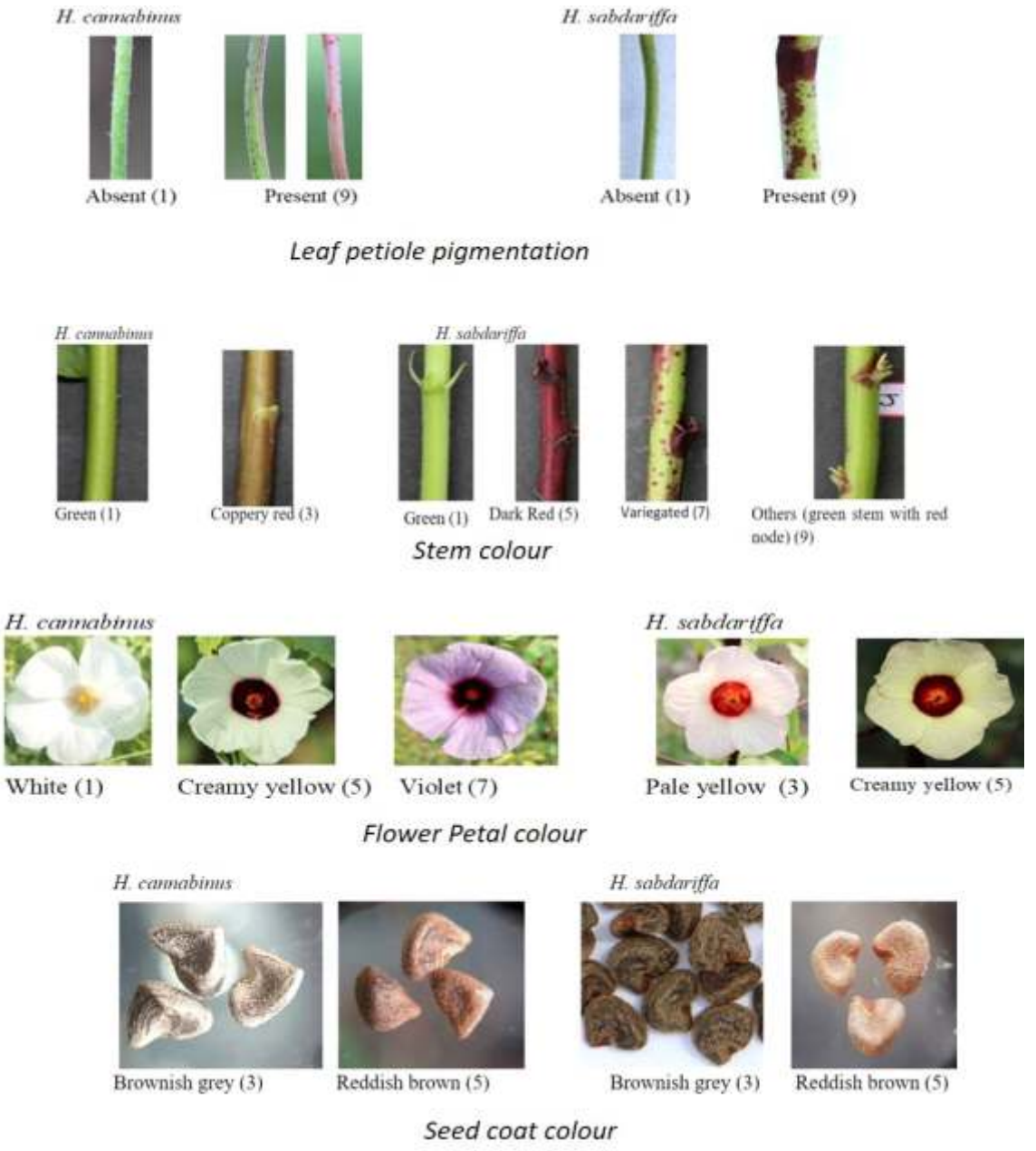


Fig. 24. Descriptors of mesta (*H. cannabinus* and *H. sabdariffa*)

4. Seed Production

4.1 Quality seed production of jute and allied fibres

C. S. Kar, A. Bera and C. Chattopadhyay

Project code: Externally funded project AICRP on Seed (Crops)

Production and distribution of breeder seeds of all the national varieties of jute, mesta and sunnhemp as per the indent and allotment of the Seed Division of the Ministry of Agriculture, Department of Agriculture & Cooperation (DAC), Govt. of India is the key mandate of this project. Nucleus seeds for all the released varieties of jute and allied fibre crops are produced and maintained at CSRSJAF, Budbud. Breeder seeds of jute & allied fibres are supplied to different indenting agencies from the country.

Production of quality (certified and truthfully labelled) seeds of other crops like paddy, wheat, mustard, dhaincha etc. and their supply directly to the farmers is another major activity.

A. Breeder seed production of jute, mesta and sunnhemp: Breeder seed of 23 varieties of jute and 4 varieties of sunnhemp were produced as per indent. A total of 9.57 q of breeder seed of jute and 7.0 q of sunnhemp were produced during kharif 2023 against the DAC indent (2024-25) of 4.97 q and 0.90 q, respectively. The variety wise details are given in Table 12.

Table 12. Breeder Seed Production of Jute & Allied Fibre crops against DAC indent

Sl.No.	Variety	DAC & Other indent (q)	Production (q)
Jute			
1.	JROBA-3	0.60	1.00
2.	JROB-2	1.20	1.20
3.	JROM-1	0.10	0.40
4.	JROG-1	0.10	0.40
5.	CO-58	0.32	0.60
6.	JRC-532	0.10	0.10
7.	JBO-2003H	0.25	0.50
8.	JRO-204	1.65	2.85
9.	JRO-524	0.10	0.20
10.	JRO-2407	0.20	0.30
11.	S-19	0.10	0.30
12.	JRC-212	0.25	0.82
13.	JROMU-1	-	0.10
14.	JBO-1	-	0.10
15.	JRO-8432	-	0.10
16.	JRO-878	-	0.05
17.	JRC-321	-	0.10
18.	JRC-80	-	0.05
19.	JRC-517	-	0.05
20.	JRC-9057	-	0.10
21.	JRCJ-11	-	0.10
22.	JRC-698	-	0.10
23.	JRCM-2	-	0.05
	Total	4.97	9.57
Sunnhemp			
1.	SUIN-03	0.50	0.50
2.	JRJ-610	2.50	2.50
3.	SUIN-053	3.50	3.50
4.	SUIN-037	0.50	0.50
	Total	7.00	7.00
	Grand Total	11.97	16.57

Additionally, 3.5 q of breeder seed of flax variety JRF-2 was also produced during rabi 2023 to meet the demand of other agencies for 2024-25 indent. During 2024, two jute varieties JROBA3 and JROB2 and flax variety JRF-2 have been commercialized to three private agencies through nonexclusive licensing for 5 years.

B. Grow Out Test: Grow out test (GOT) was carried

out to check the genetic purity of the breeder seeds of all the indented varieties of jute. Percentage off-types present in the varieties was recorded by making critical observations on the important morphological parameters (*i.e.,* leaf shape, leaf- or stem- pigmentation, flowering, capsule/pod, seed coat *etc.*). GOT was performed during March-May 2024 before supplying breeder seed. Percentage off type present in each of the jute and allied fibres varieties were within the permissible limit.

C. Production and maintenance of nucleus seeds: Seeds harvested from selected individual true to type plants of a variety were used to raise progeny rows. Progeny rows found to be true to the type of varieties (jute, mesta and sunnhemp) were bulked to constitute nucleus seed. Off-type plants found in any progeny row of nucleus seed plots, entire progeny row was eliminated to obtain purest seeds. A total of 229.6 kg of nucleus seeds of the released varieties of jute (94.9 kg of 32 varieties), HC mesta (28.2 kg of 11 varieties) and roselle (49.5 of 12 varieties), sunnhemp (27 kg of 4 varieties) during kharif and flax (30 kg of JRF-2) during rabi were produced and kept safely for breeder seed production in 2024.

Table 13. Nucleus seed production 2023-24

S. No.	Variety	Production (kg)	S. No.	Variety	Production (kg)
Jute			Mesta		
1.	JRO-524	2.5	1.	JRHC-3	4.5
2.	JRO-204	8.5	2.	MT 150	2.0
3.	JROM-1	3.0	3.	HC 583	1.0
4.	JBO-2003-H	3.0	4.	JBMP 4	0.7
5.	S-19	7.5	5.	AMC-108	1.0
6.	JROMU-1	4.0	6.	JRKM 9-1	1.5
7.	CO-58	5.5	7.	JBMP-3	5.0
8.	JROB-2	1.5	8.	JBMP-5	2.0
9.	JROG-1	1.0	9.	JRM-5	3.5
10.	JRO-620	2.0	10.	JBMG-5	2.5
11.	JROBA-3	3.5	11.	JBM-81	4.5
12.	AAUOJ	0.5		Total	28.2
13.	JBO 1	1.5	Roselle		
14.	JRO 66	0.5	1	HS 7910	5.5
15	JROV 5	1.0	2	HS 4288	8.5
16.	JRO 7835	1.5	3	HSLC 1	7.5
17.	B. RUPALI	2.0	4	JRR 17	4
18.	JRC 321	4.0	5	JRHS 1	2.5
19.	JRC 517	8.0	6	AMV 3	3
20.	JRC 80	4.0	7	AMV 4	1.5
21.	JRCP 5	5.4	8	AMV 5	3.5
22.	JRC 532	4.0	9	AMV 7	4.5
23.	JRC 9057	2.0	10	AMV 8	2
24.	KC-1	6.0	11	AMV 9	4.5
25.	JRC 212	1.5	12	AMV 10	2.5
26.	KTC 1	2.5		Total	49.5
27.	JRCJ-11	1.0	Sunnhemp		
28.	Monalisa	1.0	1.	SUIN-053	8.0
29.	Padma	1.0	2.	SUIN-03	5.0
30	JBC-5	1.0	3.	SUIN-037	7.0
31	B. PAT 3	2.5	4.	JRJ-610	7.0
32	JRC4444	2.0		Total	27.0
	Total	94.9	Flax	JRF-2	30.0
				Grand Total	229.6

D. Quality seed production JAF and other crops: Seeds of different crops were produced under this project for distribution among farmers. TL seeds of flax variety JRF-2 was also undertaken. A total of approximately 725.41q of seeds have been produced. The detailed list is given below:

Table 14. Quality Seeds produced 2023-24

S. No	Crop	Production (q)
1.	Jute (TL)	2.10
2.	Mesta (TL)	0.75
3.	Dhaincha (TL)	10.05
4.	Paddy (Certified) var. MTU 7029, IET4786	700.00
5.	Mustard (TL) var. B9	4.00
6.	Wheat (TL) var. DBW187	6.00
7.	Flax (TL) var. JRF 2	1.00
8.	Mungbean var. IPM2-24, Virat, Surya	1.51
	Grand Total	725.41

CROP PRODUCTION

Overview

JAF growing tracts of India are classified into nine agro-climatic zones comprising of the alluvial and red & lateritic soils and sandy loam to clay loam in texture. Alluvial soils are derived mainly from the deposition of the Ganges and the Brahmputra river systems and carry ample potash and phosphoric acid. They are, however, deficient in nitrogenous and organic compounds, resulting in low soil fertility and nitrogen use efficiency. JAF is predominantly grown as a rainfed crop by the marginal and small farmers. Drought, cyclone, insufficient quantity of retting water, and weed infestation are the most important issues in the changing climatic scenario, so, the Crop Production Division has been taken scientific research programmes aiming to develop economically viable and sustainable JAF production system.

Priorities & Thrust Areas

- Maintenance of soil health, recycling of organic wastes, and improvement in fertilizer use efficiency
- Microbial formulation for improved retting resulting in fibre quality to meet industrial requirement
- The carbon sequestration research for sustainable management of soil resources
- Integrated weed management, conservation agriculture, tillage and nutrient interactions
- Crop simulation, energy efficient farming, economising cost of cultivation & drudgery reduction

Research Highlights of 2024

- Long-term studies at CRIJAF have demonstrated the effectiveness of integrated nutrient management strategies for bast fibre crop production systems. The treatment of 100% NPK + FYM proved most effective in the jute-rice-wheat rotation for optimizing crop yields and soil quality.
- Combining 50% NPK fertilizer with 50% compost substantially increased carbon pool management index and soil organic carbon sequestration rates in jute, flax, and ramie cultivation.
- Efficient irrigation practices like sprinkler irrigation at 50% DASM optimized water and energy usage while maximizing system productivity in jute.
- Varietal differences were observed, with the capsularis jute variety JRC J11 showing better tolerance to early waterlogging compared to the olitorius variety JRO 204.
- In sisal, combining large suckers with high fertilizer doses yielded maximum fibre. INM treatments in flax boosted yields by 85-110%.
- Eddy covariance analysis confirmed jute's role as an effective net carbon sink crop.
- Bioethanol production using lignocellulosic feedstocks from jute and kenaf impressively reduced GHG emissions by 78-81%.
- Free-flowing retting conserved water and enhanced fibre recovery and quality in jute processing.
- The Jute-ICARE project reached 2.25 lakh hectares benefiting 5 lakh farmers, with yield gaps bridged by 43-74% using CRIJAF technologies.
- Mechanization efforts led to the development of efficient machines like a power-operated jute ribboner, modified nail weeder, battery-operated weeder, and multi-crop seed drill for bast fibre crop production.

1. Soil and Water Productivity

1.1 Changes in soil quality and crop productivity under long term fertilizer experiment

B. Majumdar, S.P. Mazumdar, S. Saha, R. Saha, K. Mandal and D. Datta

Project Code: External Funded Project - AICRP-LTFE

The long-term fertilizer experiment, initiated in 1971, aimed to evaluate the effects of continuous fertilizer applications on crop productivity, nutrient uptake, and soil health in a jute-rice-wheat cropping system. Application of 150% NPK and 100% NPK + FYM treatments recorded significantly higher yields of all three crops, over other treatments and both the treatments were at par (Fig. 25). For wheat, the yields were 39.40 q/ha with 150% NPK and 39.04 q/ha with 100% NPK + FYM, while for rice, the highest grain yield of 38.72 q/ha was achieved with 100% NPK + FYM. Jute fibre yields were also maximized with 100% NPK + FYM (38.56 q/ha) and 150% NPK (36.66 q/ha). The 100% NPK treatment demonstrated good performance but was slightly lower to the above combinations. In contrast, imbalanced treatments such as 100% NP and 100% N resulted in lower yields, while the control (no fertilizers) showed the poorest performance, highlighting the critical role of fertilization. Interestingly, zinc application (100% NPK+Zn) did not yield additional benefits compared to 100% NPK treatment.

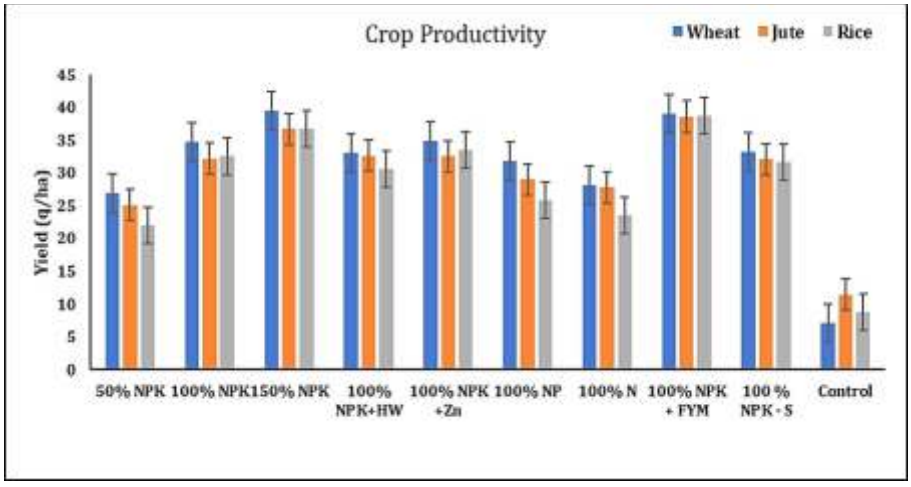


Fig. 25. Effect of different fertilizer treatments on crop productivity of wheat, jute and rice

In terms of soil health, 100% NPK+FYM treatment resulted in the highest organic carbon content (0.90%), significantly improving soil fertility. This treatment also recorded the highest soil available nitrogen (343.15 kg/ha), while the 150% NPK treatment recorded the maximum levels of available phosphorus (76.12 kg/ha) and potassium (249.54 kg/ha). However, phosphorus depletion was observed in treatments like 100% N and the control. The microbial activity in the soil, measured through enzymatic activities, viz. FDA, DHA, phosphatase and soil microbial biomass carbon (SMBC), was maximum in the 100% NPK + FYM treatment, followed closely by 150% NPK (Fig. 26). These results demonstrate a strong correlation between nutrient management practices and soil microbial dynamics, emphasizing the importance of incorporating organic amendments to sustain soil biodiversity and functionality.

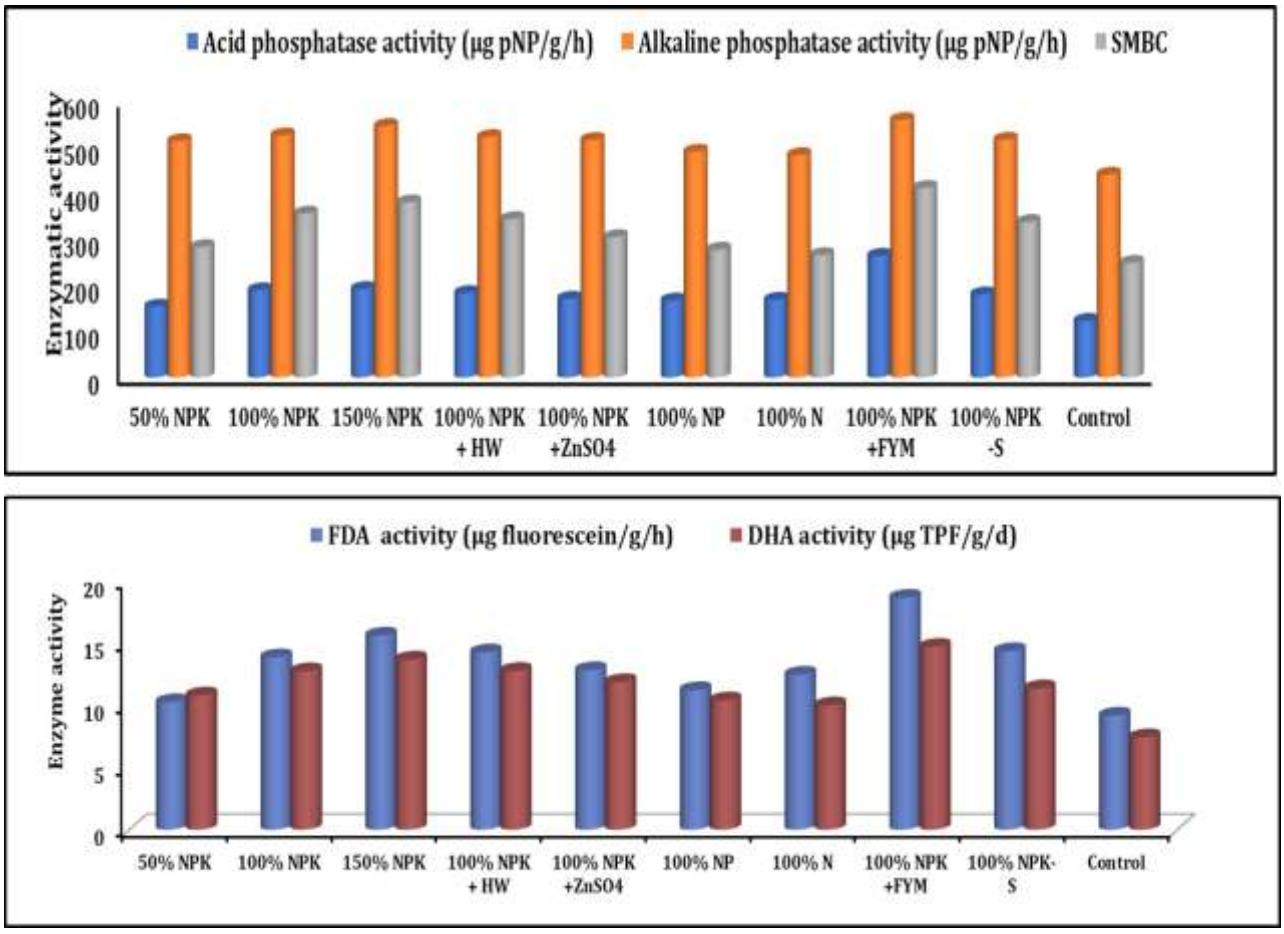


Fig. 26. Long-term effect of manure and fertilizr use on biological properties of soil

1.2 Soil test and resource based integrated plant nutrient management

S.P. Mazumdar, B. Majumdar, N.M. Alam, S. Ghosh, and S. Sarkar

Project Code: External Funded Project- AICRP-STCR

Soil test based targeted yield equation for garlic in alluvial soil of Eastern India was developed from the field trials conducted during rabi season (2023-24) by taking into account the nutrient requirement and contribution of N, P and K from various nutrient sources (soil, fertilizer and FYM). During the 2023-24 season, the validity of yield targets for mustard (cv. Kesari 5111) was tested at farmers' fields through five follow-up trials. The trials aimed to achieve targeted yields of 15 and 20 q/ha of mustard grain. The verification trial for mustard was conducted on an area of 0.908 hectares at Ghetugachi village, Haringhata, Nadia district.

Table 15. Verification of IPNS fertilizers prescription equations of mustard crop (cv. Kesari 5111)

Treatment	Yield (q/ha)	Yield deviation	B:C Ratio
T_1- Farmers Practice	13.78	-	1.6
T_2-RDF	14.50	-	1.7
T_3-ST-TY (15 q/ha)	15.50	(+) 3.3	1.8
T_4-ST-TY (15 q/ha) +IPNS-1	16.40	(+) 9.3	1.9
T_5-ST-TY (20 q/ha)	20.80	(+) 4.0	2.9
T_6- ST-TY (20 q/ha) +IPNS-2	22.70	(+) 13.5	3.1

mean value of five locations

The verification trials of mustard achieved the targeted yield of mustard (15 and 20 q/ha) with the application of inorganic fertilizer on the basis of ST-TY with and without FYM. Specifically, ST-TY alone achieved the 20 q/ha mustard (cv. Kesari 5111) seed yield with a (+) 4.0% deviation, while integrating FYM with inorganic fertilizer exceeded the target yield with a notable (+) 13.5 % deviation (Table 15). The yields of jute and mustard from farmers' practice and recommended dose of fertilizer application were significantly lower than the application of fertilizer on ST-TY basis. These findings showed the efficacy of the proposed equations and highlight the potential for integrated fertilizer strategies in optimizing jute and mustard yields.

Fig. 27. Field experiment conducted to develop soil test based targeted yield equation for garlic

Fig. 28. Verification trial for mustard at Ghetugachi village, Haringhata, Nadia district

1.3 Substitution of mineral fertilizer with organic compost to improve soil labile organic carbon and crop yield

A.K. Singh, S. Mitra, B. Majumdar, S. Satpathy, S.K. Sarkar and G. Kar

Project code: In-house project-JA 8.1

Substituting mineral fertilizers with compost can have multiple impacts on crop productivity, environmental emissions, and soil organic carbon (SOC) sequestration. This study aimed to explore the specific pathways through which complete or partial replacement of mineral fertilizers with compost affects soil carbon dynamics and crop yields. A three-year field experiment was conducted to compare four different treatments - a 100% NPK mineral fertilizer (F_{100}), a 50/50 mix of mineral and compost fertilizers (F_{50}), a 100% compost treatment (Fc), and a control with no fertilizer application (F_0) for jute and flax fibre crops. Compared to the F_{100} treatment, the Fc and F_{50} treatments significantly increased total SOC content by 20–24%. The compost-based treatments also had the highest carbon pool management index (CPMI). Importantly, the F_{50} treatment actually had a higher soil organic carbon sequestration rates (SOCSR) compared to the Fc (Fig. 29). At the same time, the compost treatments maintained jute and flax fibre yields compared to the mineral fertilizer benchmark. This study has also shown that the specific impacts of compost application on SOC can vary considerably depending on the climate change scenario under RCP4.5 and RCP8.5. These findings demonstrate the potential of compost application to enhance soil carbon storage, a crucial ecosystem service for climate change mitigation.

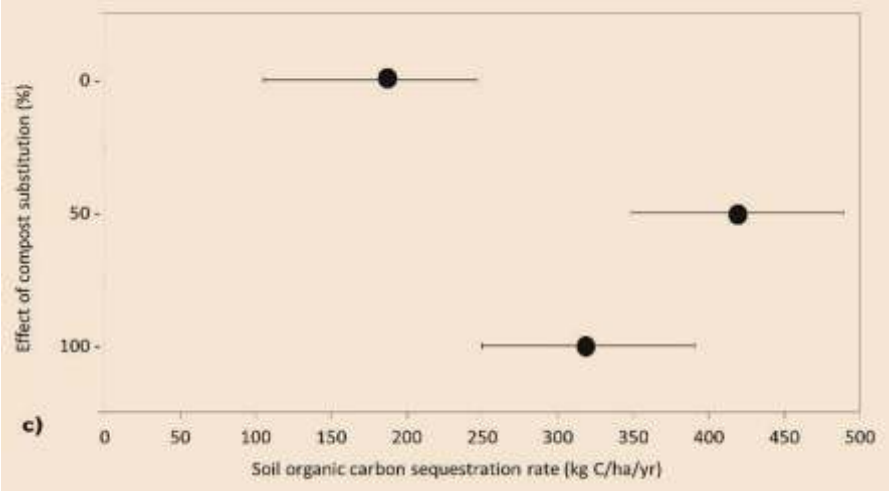


Fig. 29. Effects of compost substitution on soil organic carbon sequestration rate for jute and flax production under three substitution rates. Error bars represent 95% confidence

In ramie crop trials (2024), five cuttings were taken to estimates the fibre yield under different fertiliser treatments. The highest value (15.98 q/ha) of total fibre yield (sum of five cuts) was recorded with ramie crop receiving 50% BSC + 50% NPK (T_3) fertilizer treatment though the yield was statistically at par with the fibre yield recorded with 50% BGSC + 50% NPK (T_4) (12.84 q/ha) and 100% NPK (inorganic) (T_5) (14.76 q/ha). All the fertilizer treatments (inorganic, organic or combined) recorded significantly higher fibre yield of the crop over control treatment (4.72 q/ha). Almost similar trend was recorded during the individual cuttings of ramie also where the fibre yield of the crop recorded with the INM treatments (T_3 and T_4) were statistically at par with the fibre yield recorded with T_5 (100% NPK) treatment. This indicated a scope of savings of 50% of the inorganic fertilizer dose in ramie without affecting the average fibre yield of the crop (Fig. 30).

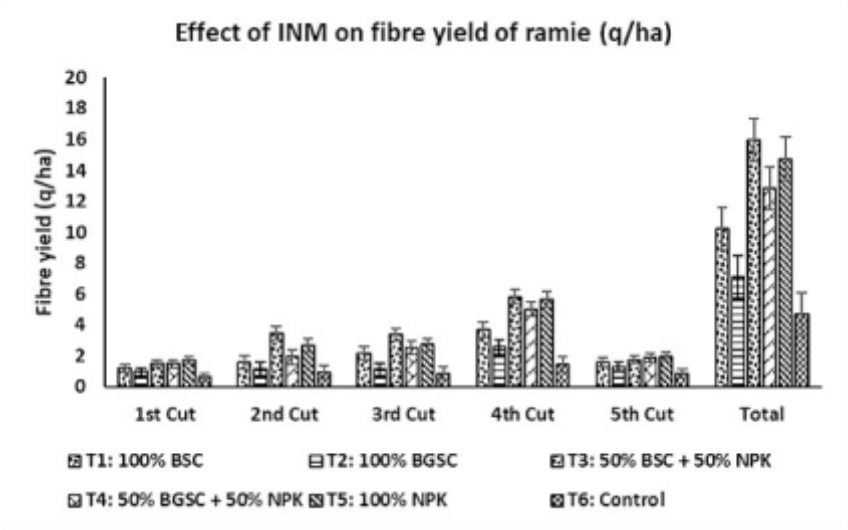


Fig . 30. Fibre yield of ramie as influenced by INM at Barrackpore, Kolkata

1.4 Morphological and biochemical characteristics of phosphate and potassium solubilizing bacteria

Lavanya A.K., S. Saha, S. Datta, S.K. Sarkar and D. Datta

Project code: In-house project-JA 8.7

In the present study, twenty three phosphate solubilizing bacteria (PSB) namely, JRPS-324, JRPS-63, JRPS-93, JRPS-123, JRPS-81, JRPS-101, JRPS-42, JRPS-85, JRPS-67, JRPS-112, JRPS-13, JRPS-335, JRPS-24, JRPS-294, JRPS-49, JRPS-60, JRPS-97, JRPS-54, JRPS-16, JRPS-31, JRPS-347, JRPS-226, and JRPS-183 and twelve potassium solubilizing bacteria (KSB) namely, JRKS-287, JRKS-294, JRKS-248, JRKS-123, JRKS-238, JRKS-178, JRKS-158, JRKS-231, JRKS-240, JRKS-355, JRKS-169, and JRKS-361, and which showed inorganic phosphate (>100 ug/ml) and potassium (>4 ug/ml) solubilizing efficiency, respectively were examined for the colony morphologies (shape, surface, elevation, margin, and colour of the colony). Inoculation on nutrient agar (Ingredients – g/L, beef extract - 3, peptone - 5, Nacl - 5, and agar - 20) containing petri dish, their response toward Gram-staining reagent and endospore staining reagent and also biochemical identification (catalase enzyme production, starch hydrolysis and citrate utilisation) was carried out using the standard procedures. The stained bacterial cells were observed under a microscope to determine their Gram reaction for presence of endospore, and cell shape (Fig. 31A, B and Fig. 32A, B).

The selected PSB and KSB isolates were distinguished based on their various morphological and biochemical characteristics (Table 16 and Table 17). The results indicated that most of the isolates had round shapes and entire colony margins, whereas JRPS-81, JRPS-101, JRPS-67, JRPS-97, JRPS-16, JRPS-347, JRPS-183, JRKS-287, JRKS-178, and JRKS-169 isolates showed irregular colony shapes and margins. The majority of the isolates were small to medium in size, whereas JRPS-123, JRPS-85, JRPS-24, JRPS-54, and JRKS-123 isolates were larger. Most of the selected isolates had a flat elevation; however, JRPS-324, JRPS-93, JRPS-123, JRPS-101, JRPS-85, JRPS-54, JRPS-226, JRKS-123, JRKS-178, and JRKS-355 isolates had a raised elevation. The colony colour of most of the isolates was cream, whereas some isolates were off-white in colour, namely, JRPS-123, JRPS-183, JRKS-287, and JRKS-123, while two isolates (JRPS-24 and JRPS-16) were yellow in colour. The cell shape of all the isolates was rod, while the difference in the length of the rods was also observed. The Gram-staining test result showed that 12 PSB isolates and 4 KSB isolates were confirmed as Gram-positive while the remaining 11 PSB and 8 KSB isolates were found to be Gram-negative. Besides, 12 isolates (JRPS-335, JRPS-24, JRPS-294, JRPS-49, JRPS-60, JRPS-97, JRPS-54, JRPS-16, JRKS-240, JRKS-355, JRKS-169, and JRKS-361) were found to be spore formers. The majority of the isolates tested positive for catalase, starch hydrolysis, and citrate utilisation; however, JRPS-31, JRPS-347, JRPS-226, and JRPS-183 isolates tested positive for catalase and negative for starch hydrolysis and citrate utilisation. It can be summarised that the probable genera of PSB and KSB isolates, according to biochemical studies, were Bacillus, Pseudomonas, and Propionibacterium. To validate these results, further biochemical studies and molecular identification of these isolates are required.

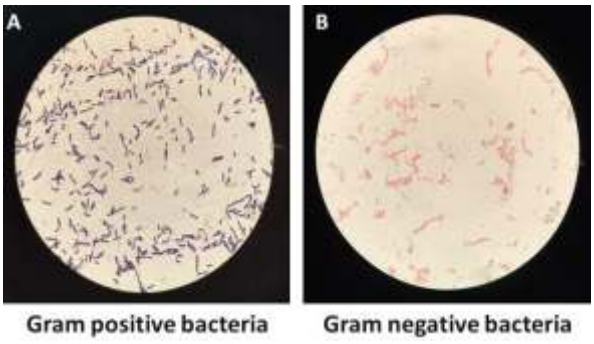


Fig. 31. Gram's staining of rhizobacteria

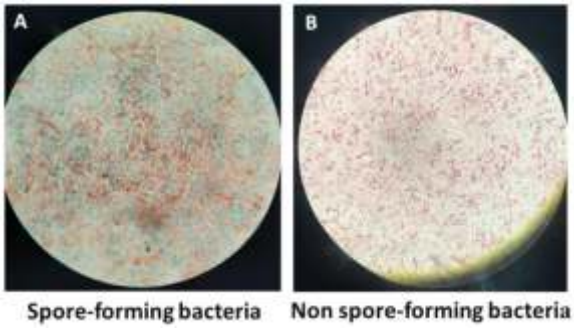


Fig. 32. Endospore staining of rhizobacteria

Table 16. Morphological, gram staining, endospore staining and microscopic observations of phosphate solubilizers

Isolate name	Morphological characteristics							Biochemical characteristics					Probable genus
	Colony shape/form	Size	Surface	Elevation	Colony margin	Colony colour	Cell shape	Gram's reaction	Endospore formation	Catalase test	Starch hydrolysis	Citrate utilization	
JRPS-124	Round	Medium	Rough	Raised	Entire	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRPS-63	Round	Medium	Rough	Flat	Entire	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRPS-93	Round	Medium	Smooth	Raised	Entire	Cream	Rod	+	+	+	+	+	*Pseudomonas*
	Round	Large	Smooth	Raised	Entire	Off white	Rod	-	-	+	+	+	*Pseudomonas*
JRPS-125													
JRPS-81	Irregular	Small	Rough	Flat	Irregular	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRPS-101	Irregular	Medium	Smooth	Raised	Irregular	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRPS-42	Round	Small	Rough	Flat	Entire	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRPS-88	Oval	Large	Smooth	Raised	Entire	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRPS-67	Irregular	Small	Smooth	Flat	Irregular	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRPS-112	Round	Medium	Rough	Flat	Entire	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRPS-13	Round	Small	Smooth	Flat	Entire	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRPS-556	Round	Small	Rough	Flat	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRPS-24	Round	Large	Smooth	Flat	Entire	Yellow	Rod	+	+	+	+	+	*Bacillus*
JRPS-284	Round	Small	Smooth	Flat	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRPS-48	Round	Small	Smooth	Flat	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRPS-60	Round	Small	Rough	Flat	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRPS-97	Irregular	Medium	Smooth	Flat	Irregular	Cream	Rod	+	+	+	+	+	*Bacillus*
JRPS-84	Round	Large	Smooth	Raised	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRPS-16	Irregular	Small	Smooth	Flat	Irregular	Yellow	Rod	+	+	+	+	+	*Bacillus*
JRPS-81	Round	Small	Rough	Flat	Entire	Cream	Rod	+	-	+	-	-	*Propionibacterium*
JRPS-547	Irregular	Medium	Smooth	Flat	Irregular	Cream	Rod	+	-	+	-	-	*Propionibacterium*
JRPS-226	Round	Medium	Rough	Raised	Entire	Cream	Rod	+	-	+	+	+	*Propionibacterium*
	Irregular	Small	Rough	Flat	Irregular	Off white	Rod	+	-	+	-	-	*Propionibacterium*
JRPS-183													

Table 17. Morphological, gram staining, endospore staining and microscopic observations of potassium solubilizers

Isolate name	Morphological characteristics							Biochemical characteristics					Probable genus
	Colony shape/form	Size	Surface	Elevation	Colony margin	Colony colour	Cell shape	Gram's reaction	Endospore formation	Catalase test	Starch hydrolysis	Citrate utilization	
	Irregular	Medium	Smooth	Flat	Entire	Off white	Rod	-	-	+	+	+	*Pseudomonas*
JRKS-287													
JRKS-294	Round	Small	Smooth	Flat	Entire	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRKS-248	Round	Small	Rough	Flat	Entire	Cream	Rod	-	-	+	+	+	*Pseudomonas*
	Round	Large	Smooth	Raised	Entire	Off white	Rod	-	-	+	+	+	*Pseudomonas*
JRKS-123													
JRKS-123	Round	Large	Smooth	Raised	Entire	White	Rod	+	+	+	+	+	*Pseudomonas*
JRKS-238	Round	Small	Smooth	Flat	Entire	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRKS-178	Irregular	Medium	Smooth	Raised	Irregular	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRKS-158	Round	Small	Rough	Flat	Entire	Cream	Rod	-	-	+	+	+	*Pseudomonas*
JRKS-231	Round	Small	Rough	Flat	Entire	Cream	Rod	+	+	+	+	+	*Pseudomonas*
JRKS-240	Round	Small	Rough	Flat	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRKS-355	Round	Medium	Smooth	Raised	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*
JRKS-169	Irregular	Small	Smooth	Flat	Irregular	Cream	Rod	+	+	+	+	+	*Bacillus*
JRKS-361	Round	Medium	Smooth	Flat	Entire	Cream	Rod	+	+	+	+	+	*Bacillus*

1.5 Precision irrigation scheduling for augmenting yield, resource-use efficiency and water productivity in jute-rice-flax cropping systems

S. Ghosh, G. Kar, S. Mitra, A.K. Singh, T. Samajdar, R.K. Naik and D. Barman

Project Code: In-house Project No. JA 8.8

Sprinkler irrigation in jute-rice-flax cropping system was evaluated for energy budgeting as well as soil microbial properties. The treatments included sprinkler irrigation at 50% DASM (SPK 50 DASM), sprinkler irrigation at 75% DASM (SPK 75 DASM), surface irrigation at 75% DASM (SUR 75 DASM), and a control with one post-sowing irrigation. Sprinkler irrigation at 50% DASM required approximately 175% more irrigation energy than the control but used lower energy inputs compared to surface irrigation at 75% DASM. Sprinkler irrigation at 75% DASM further reduced irrigation energy input by about 20% compared to surface irrigation (Fig. 33a). Energy efficiency, a measure of output energy relative to input energy, was highest in SPK 50 DASM, showing an increase of over 15% compared to the control. SPK 75 DASM and SUR 75 DASM also demonstrated improved efficiency, though to a lesser extent, with increases of 8% and 4%, respectively, over the control. Net energy returns followed a similar trend. SPK 50 DASM achieved the highest net returns, registering an increase of more than 40% over the control. SUR 75 DASM also showed a 30% increase, while SPK 75 DASM recorded a slightly lower increase of 25% compared to the control. The results emphasize the effectiveness of sprinkler irrigation, particularly at 50% DASM, in maximizing energy gains (Fig. 33b).

The impact of irrigation strategies on soil microbial properties was assessed through measurements of Fluorescein Diacetate Activity (FDA), Dehydrogenase Activity (DHA), and Microbial Biomass Carbon (MBC) at 30 days after sowing (DAS) and 45 DAS in the ongoing study at ICAR-CRIJAF. At 30 DAS, all sprinkler and surface irrigation treatments showed higher soil microbial activity than the control. FDA activity under SPK 50 DASM was 57% higher compared to the control, with SPK 75 DASM and SUR 75 DASM also showing increases of 31% and 38%, respectively. Similarly, DHA was 55% higher in SPK 50 DASM compared to the control, followed by SUR 75 DASM and SPK 75 DASM. For MBC, SPK 50 DASM exhibited an increase of 46% over the control (Fig. 34a).

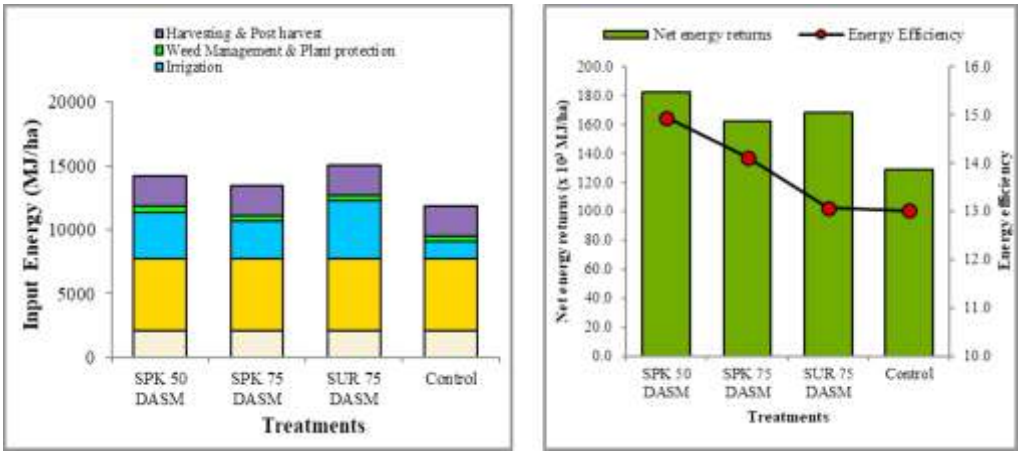


Fig. 33. a. Operation wise input energy in jute, b. Net energy returns and energy efficiency in jute

These findings highlight that SPK 50 DASM optimizes conditions for microbial activity early in the growing period. By 45 DAS, microbial properties continued to reflect the benefits of advanced irrigation strategies. FDA activity under SPK 50 DASM was 31% higher than the control, with SUR 75 DASM and SPK 75 DASM also showing significant increase. The trend was consistent for DHA, where SPK 50 DASM and SUR 75 DASM showed increases of ~39% compared to the control. For MBC, SPK 50 DASM achieved the highest levels, recording an increase of 31% over the control (Fig. 34b). The results indicate sustained microbial activity enhancement due to optimized water and aeration dynamics under sprinkler irrigation.

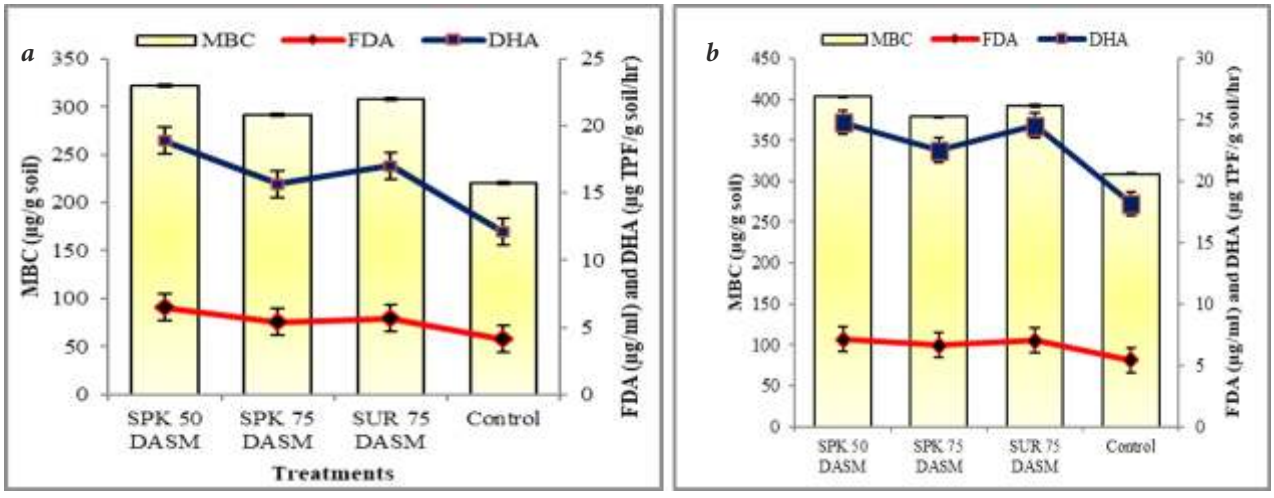


Fig. 34. Soil microbial activity in jute rhizosphere at 30 DAS (a) and 45 DAS (b)

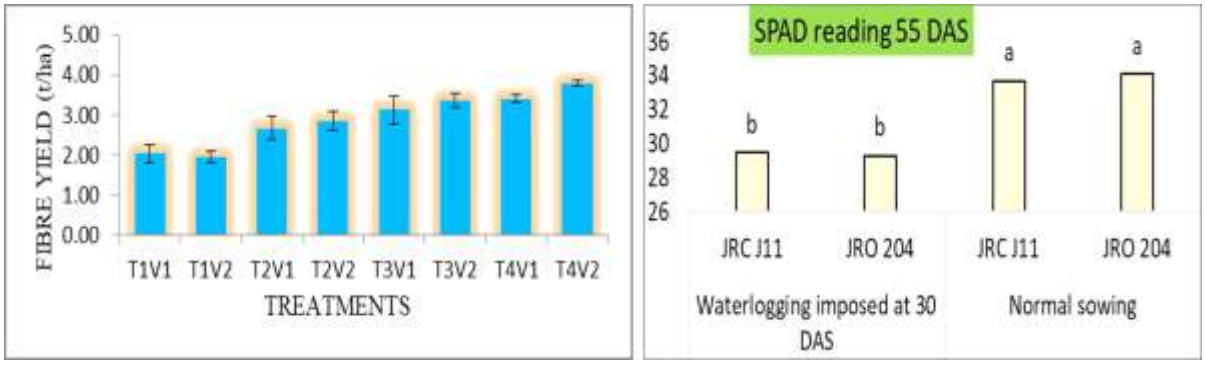
1.6 Water management strategies for profitable and sustainable jute cultivation under rainfed and irrigated ecosystems

D. Datta, G. Kar, A.K. Singh, D. Barman, N.M. Alam and R.K. Naik

Project Code: In-house Project-JA 8.5

The objective of this project was to find the effect of waterlogging at different days after sowing on jute ecotypes. Waterlogging was imposed at 30, 45, and 60 DAS for 15 days and was compared with normal sowing conditions with proper drainage. Two varieties were selected, viz. JRO 204 (*C. olitorius*) and JRC J11 (*C. capsularis*). A severe reduction in plant biometrics was observed. Reduction in plant height, ranging from 42-45%, was observed when waterlogging stress was imposed on 30-day-old seedlings. In contrast, when standing water was imposed at the mature stage (60 DAS), the reduction in plant height was comparatively lower, at 12-15%. Waterlogging conditions imposed on 30-day-old seedlings for 15 days led to a reduction in SPAD values by 8-12% in both *capsularis* and *olitorius*. Under waterlogged conditions, the relative leaf water content decreased by approximately 12-13% compared to the control plants. Almost a 38-40% increase in MDA (malondialdehyde content) was recorded when waterlogging was imposed at 30 DAS as compared to the control, which indicates increased

oxidative stress in plants. Waterlogging imposed on 30-day-old seedlings resulted in a significant reduction in fibre yield, with a decrease of 40-48% in both varieties. Waterlogging at 45 DAS caused a yield reduction of 22-24%, while at 60 DAS, the reduction was relatively less, at 8-11%. The variety JRC J11 exhibited better tolerance during the early growth stages (when waterlogging was imposed at 30 and 45 DAS) compared to JRO 204.



T1: Waterlogging imposed at 30 DAS ; T2: Waterlogging imposed at 45 DAS ; T3: Waterlogging imposed at 60 DAS; T4: Normal sowing condition with proper drainage V1: JRCJ 11 V2: JRO 204

Fig. 35. Jute plants grown (cv. JRC J11 and JRO 204) under water logging and rainfed condition

1.7 Morpho-physiological parameters affected by the waterlogging stress in jute

Divte P.R., G. Kar, S. Saha, S.P. Mazumdar and K.N. Chourasia

Project Code: In-house Project Code- JA 8.9

A study was conducted on tossa jute (JRO 204 and JRO BA3) and white jute (JRC J11 and JRC 212) genotypes to evaluate their morpho-physiological responses under waterlogging conditions. Forty-five (45) day-old plants grown in the pot culture were subjected to waterlogging stress by maintaining a water level (15 cm) in pots for 5, 10, and 15 days. Various morpho-physiological and biochemical parameters, including plant height, basal diameter, plant dry biomass, total chlorophyll content, and relative water content (RWC), were recorded at 5, 10, and 15 days after waterlogging. The plant height was found to decline by 14.8-22.1% across genotypes compared to their control under waterlogging stress. However, basal diameter showed negligible variation under 5 and 10 days of waterlogging (DWL), while a marked reduction was observed under 15 DWL stress across genotypes. Further, the plant dry biomass and total chlorophyll content decreased by 14.1-30.9% and 1.9-35.5%, respectively, compared to

control, with the predominant reductions recorded in tossa jute under 15 DWL. Relative water content in leaves showed no significant change under 5 and 10 DWL but decreased significantly at 15 DWL in all genotypes. Thus, it may be inferred that the morpho-physiological parameters in tossa jute appeared to be more adversely affected by waterlogging stress compared to white jute genotypes.

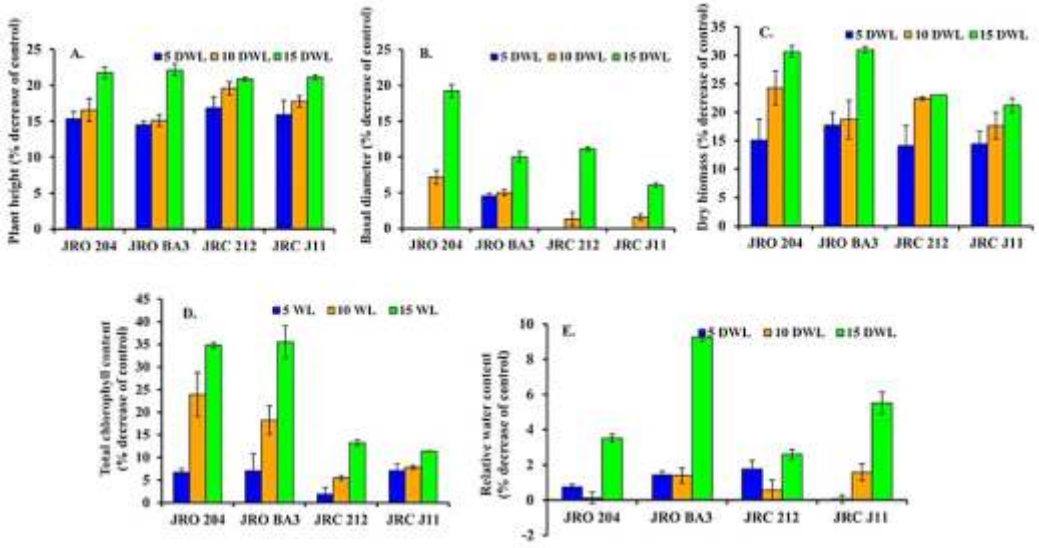


Fig. 36. Percent (%) decrease compared to control in **A,** plant height **B,** basal diameter **C,** dry biomass **D,** total chlorophyll content **E,** relative water content of four jute genotypes under 5, 10 and 15 days of waterlogging stress

2 Climate Change and Resilient Agriculture

2.1 Quantification of CO_2 and energy balance fluxes in tropical jute-rice cropping system using eddy covariance technique

D. Barman, A. Chakraborty and G. Kar

Project Code: External Funded Project – ISRO National Carbon Project

The study aims at quantitative estimation of the ecosystem-level CO_2 exchanges at diurnal, daily, and seasonal scales from jute and rice crop fields in the alluvial soil of the Gangetic delta under a tropical hot and moist sub-humid climate in the year 2024 using an open-path eddy covariance technique. At the five different growth stages, viz. germination (1-6 DAS, days after sowing), seedling (7-36 DAS), active vegetative (37-66 DAS), fibre development (67-96 DAS), and maturity (97-114 DAS) stages, the daily mean net ecosystem exchanges of CO_2 (NEE) of the jute crop were found to be 2.03, –0.29, –3.55, –3.15, and –3.51 gC/m^2/day, respectively. The seasonal cumulative NEE from the jute field was found to be –260.7 gC/m^2. At the six different phenological stages, viz. vegetative (1-18 DAS), tillering to panicle initiation (19-40 DAS), reproductive stage (41-53 DAS), heading to flowering (54-73 DAS), ripening (74-86 DAS), and maturity (87-96 DAS), the daily mean NEEs of the rice crop were found to be -0.48, -1.55, -4.73, -2.97, -1.96, and -1.83 gC/m^2/day, respectively. The seasonal cumulative NEE from the rice field was found to be –207.4 gC/m^2. The jute and rice ecosystems were found to be net carbon sinks (Fig. 37).

Surface energy balance components such as net radiation (Rn), soil heat flux (G), sensible heat flux (H), and latent heat flux (LE) were computed during jute and rice seasons for precise crop management strategy development. During jute season in 2024, daytime average Rn, G, H, and LE were 420.8 (±100.4), 25.9 (±11.1), 27.8 (±17.6), and 224.6 (±40.5) W/m^2, respectively. The Rn was majorly partitioned into LE (56.2%), followed by H (6.1%) and G (6.0%). Daytime average Rn was highest in the germination stage (472.0 ± 150.1 W m^{-2}) and lowest in the fibre development stage (375.0 ± 77.4 W/m^2). During rice season in 2024, daytime average Rn, G, H, and LE were 308.9 (±100.0), 17.9 (±7.0), 15.0 (±6.2), and 77.7 (±56.0) W/m^2, respectively. The Rn was principally partitioned into LE (26%), followed by G (6.2%) and H (0.8%). Daytime average Rn was highest in the tillering to panicle initiation stage (352.5 ± 119.3 W/m^2) and lowest in the ripening stage (248.1 ± 82.0 W/m^2) (Fig. 38).

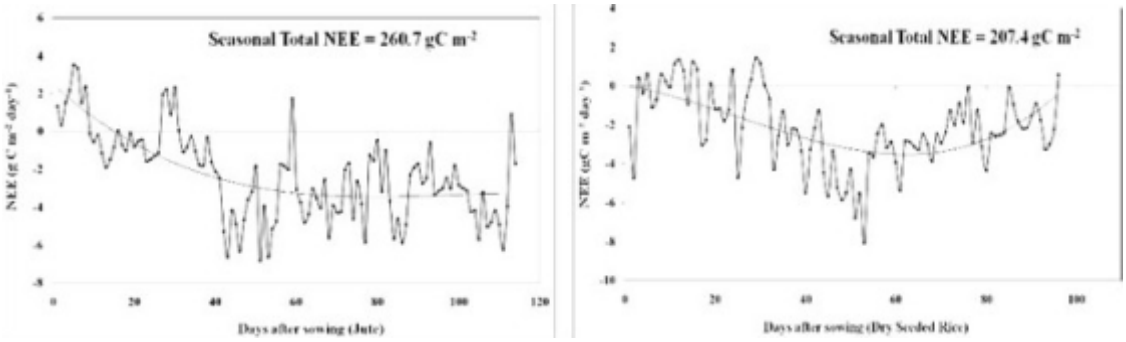


Fig. 37. Net ecosystem exchanges of CO_2 from jute and rice ecosystems (2024) in the tropical Indo-Gangetic plain

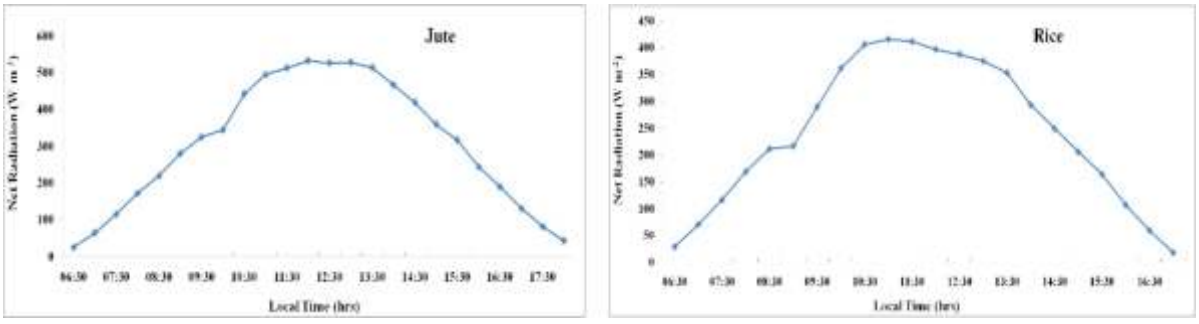


Fig. 38. Day-time net radiation during jute and rice seasons of 2024 in the tropical Indo-Gangetic plain

Eddy Co-variance equipment installed in LTFE Field, ICAR-CRIJAF

2.2 Real time sensor based water management in jute based cropping system crop

A.K. Singh, D. Datta, G. Dutta and G. Kar

Project Code: External Funded-DST-SEED

A project on "In-Season Smart Sensor Enabled Advanced Technological Interventions for Real-Time Water Management of Jute Crop for Adaptation in SC Farmer's Field under Changing Climate Scenario" was started during 2023-24 under the DST-SEED Project. This project is to develop an intelligent irrigation system for increasing water use efficiency, crop productivity, and profitability in SC farming communities. The necessary sensing elements have been collaboratively finalised, taking into consideration farmer-centric design. Design, development, fabrication of embedded microcontroller-linked instrumentation, data acquisition systems, and interfacing with the identified sensors have been undertaken, followed by the initiation of wireless transmission. Hardware prototype development of a multi-sensor hardware device for improved irrigation management for the jute-based cropping system has been done. Soils/field observations for prototype moisture sensors under laboratory and field conditions started for standardisation of the sensors. Soil analysis, CO_2 respiration, and LAI in jute and mustasrd crops have been taken (Fig. 39). The setting up of the STI Hub (KVK-Burdwan), recruitment of project staff, and installation of equipment have already been done.

A logo design has also been registered for this project. The main feature of the logo is sensor based water management method via internet technology (IoT) based on the soil, weather and plant growth. This is symbolized by the root rhizosphere and the wireless logo on the leaves. The short name of the project is incorporated into the logo, i.e., JuteWAT. A "Sensor based kit for water management in jute based agriculture" and "Mobile App for farmers" will be developed where this logo will be used as technology of ICAR-CRIJAF and CSIR-CMERI.

Fig. 39. Sensor based experiments in laboratory and field

2.3 Bioethanol from lignocellulose biomass of jute and kenaf-mesta: a green fuel for climate change mitigation

A.K. Singh, P. Satya, T. Goswami and G. Kar

Project Code: External Funded-NICRA

In this study, we examined the life-cycle greenhouse gas emissions and environmental impact of bioethanol production from the fermentation of sugars made from jute and kenaf feedstock combining soil carbon changes (Fig. 40). It was observed that net GHG emissions from crop production and bio-refinery from jute and kenaf ethanol were only 3.45 g/MJ and 5.88 g/MJ, respectively. This result is much lower than any other feedstock like sugarcane bagasse, corn stover, rice straw, and wheat straw. Life cycle assessment (LCA) revealed that ethanol produced from jute and kenaf cellulosic biomass can reduce GHG emissions by 78–81 percent when compared with fossil fuels. Bioethanol made from jute and kenaf biomass material has the least negative effects (rice straw>sugarcane bagasse>wheat straw>corn stover>jute=kenaf) on the environment and resource depletion. It might deliver roughly 60 percent of the ethanol requirement annually and may prove to be a workable technology for meeting ethanol-to-petrol blend targets.

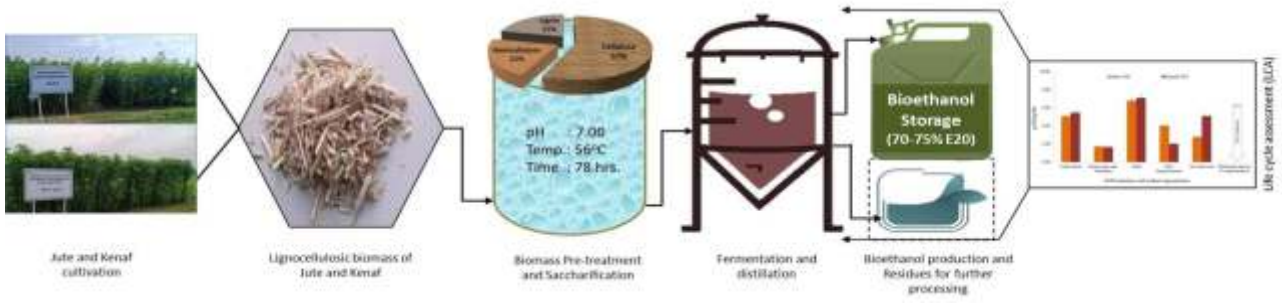


Fig. 40. Bioethanol production process under laboratory condition

2.4 Assessment of climate-soil-water-related ecosystem services on crop productivity: a case study from the Gangetic Plains and Sub-Himalayan region of eastern India

A.K. Singh, B. Majumdar and G. Kar

Project Code: External Funded-Jute ICARE

Under the Jute-ICARE project, soil samples from jute farmers's fields were analysed for the preparation of spatial soil fertility maps of jute-growing districts of West Bengal (Fig. 41). By applying a multi-faceted approach that examined four key ecosystem indicators (soil fertility, nutrient delivery ratio, carbon storage, and water footprints), we were able to map the spatial changes and identify the critical hotspots where multiple soil fertility characteristics were impacting jute fibre productivity. The findings of the study revealed a clear decreasing trend in soil fertility with nutrient index value (NIV). As per results of improved soil-crop management practices, it may be possible to optimize nutrient availability and ensure more sustainable crop yields in these economically important districts of the Gangetic Plains and the northern Sub-Himalayan area of eastern India.

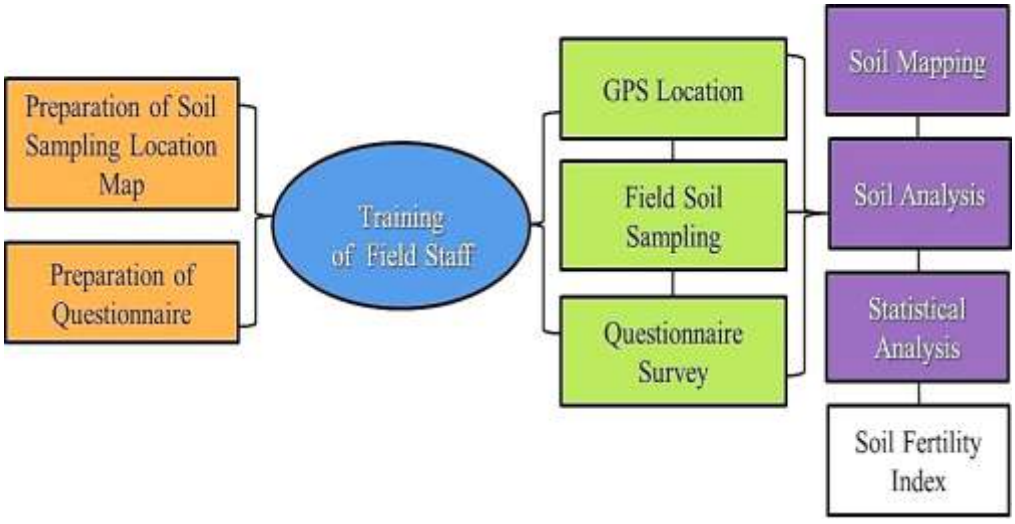


Fig. 41. Methodological flowchart for the study for climate-soil-water-related ecosystem services

2.5 Climate change vulnerability assessment of jute production in West Bengal using remote sensing and GIS

D. Barman

Project Code: External Funded Project – DSTBT (West Bengal) Project

The objective of the study was to identify climatic variability and trends in jute-growing areas of West Bengal and to assess climate change vulnerability of jute production. Daily gridded data (0.25° x 0.25°) of rainfall and maximum and minimum temperatures during the last 30 years (1994-2023) for the state of West Bengal were downloaded from the IMD web portal. The daily data were converted to weekly data for weekly trend analysis for the jute-growing season of West Bengal. The data were pre-processed using ERDAS Imagine® v.2023 and Google Earth Engine (GEE). Mann-Kendal and Sen's slope tests were performed for the weekly gridded data (meteorological standard week no. 10 to 35 for the jute growing period, Week 10: 5 to 11 Mar, and Week 35: 27 Aug to 2 Sep) using GEE. These tests resulted in computing the trends and rate of change of rainfall and temperatures. These results will be used in overlay analysis in a GIS environment for climate change vulnerability analysis of jute production in West Bengal. The Mann-Kendall test of week no. 20 is presented in Fig 42.

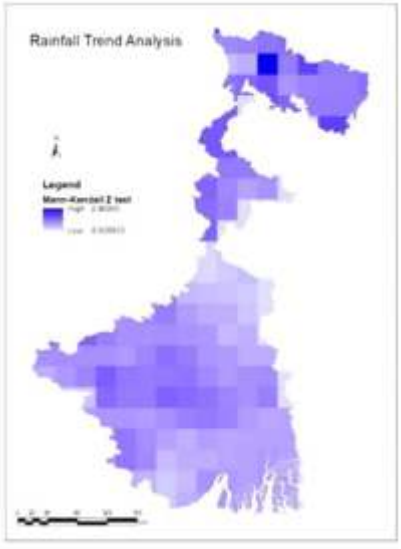


Fig. 42. Rainfall trend map of meteorological standard week no. 20 for West Bengal

3 Crop Management

3.1 Standardization of organic & natural agriculture practices for jute based agro-ecosystem

S.P. Mazumdar, G. Kar, S. Satpathy, S. Ghosh, B. Majumdar, S.K. Jha, R. Saha and S. Saha

Project Code: In house project- JA 8.6

A research was carried out at ICAR-CRIJAF Research Farm to study the effects of low-cost natural farming, organic farming, conventional and integrated farming on jute and rice yield. Different management practices significantly affected the yield attributes of jute and rice. Jute and rice yield were found highest under integrated nutrient management followed by conventional, organic and natural management. Integrated nutrient management being at par with conventional or inorganic nutrient management recorded significantly higher jute fibre yield and rice yield as compared to natural farming. A comparison between organic and conventional jute-based cropping systems showed that organic systems had a better carbon management index than conventional ones (Fig . 43) despite lower yields. Organically managed long-term jute-rice-lentil system can maintain soil quality and health by supplying sufficient labile carbon for microbial growth, enhancing enzymatic activities and diversity, and improving various soil carbon fractions.

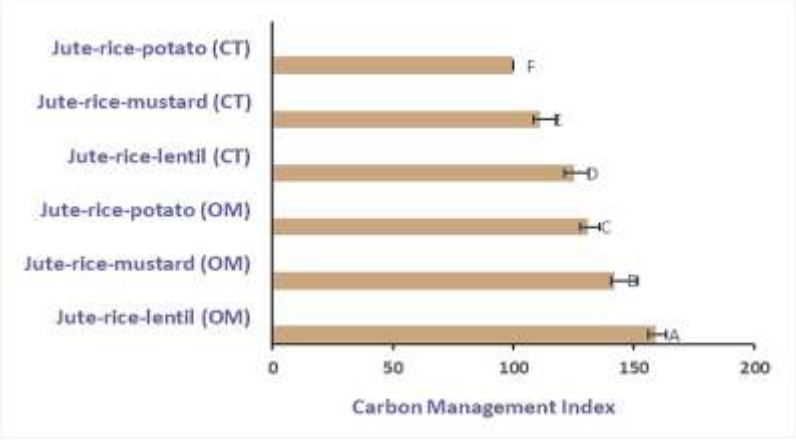


Fig. 43. Carbon management index as affected by different jute based cropping systems

3.2 Growth and yield of sisal as affected by planting materials and fertilizer levels

S. Sarkar, B. Majumdar and R.K. Naik

Project Code: In house project-SLA 1.7

Effect of sucker size and fertilizer level on Sisalana sisal: Irrespective of fertilizer dose, the highest number of leaves harvested per ha was 61.77 x 10^3 in case of large sized sucker at planting and irrespective of sucker size, the highest number of leaves harvested per ha was 61.45 x 10^3 in case of highest nutrient levels in sisalana sisal. In interaction effect, the highest number of leaves harvested per ha was in case of large sucker size at planting x highest fertilizer dose (63.91 x 10^3) followed by and at par with the number of leaves harvested in large sucker x medium fertilizer dose (62.52 x 10^3) and in medium sized sucker x highest fertilizer dose (62.39 x 10^3) (Fig. 44).

Irrespective of fertilizer dose, the highest fibre yield of sisalana sisal was obtained in case of large sized suckers (1045.3 kg/ha). Similarly, irrespective of sucker size, the highest fibre yield was recorded with highest fertilizer dose (1033.8 kg/ha). In interaction effect, the highest fibre yield was obtained with large sized sucker x highest fertilizer dose (1134.7 kg/ha) followed by and at par with the fibre yield obtained with medium sized sucker with highest fertilizer dose (1119 kg/ha)(Fig .44).

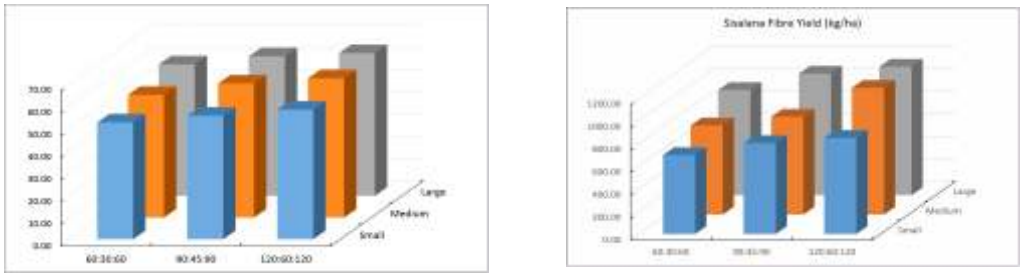


Fig. 44. Number of leaves harvested and fibre yield (kg/ha) of sisalana sisal

Effect of sucker size and fertilizer level on Hybrid sisal: In case of hybrid sisal, irrespective of fertilizer dose, the highest number of leaves harvested per ha was in large sized sucker (100.22 x 10^3); similarly, irrespective of sucker size, highest fertilizer dose gave the maximum number of harvested leaves per ha (99.95 x 10^3). In interaction effect, the highest number of leaves harvested per ha (109 x 10^3) was recorded in large sized sucker x highest fertilizer dose (Fig. 46). Irrespective of fertilizer dose, the highest fibre yield was recorded with large sized sucker (641.4 kg/ha). Similarly, irrespective of sucker size, the highest fibre yield was recorded with highest fertilizer dose (639.5 kg/ha). In the interaction effect of the two factors, the highest fibre yield was obtained with large size sucker at planting x highest fertilizer dose (697.3 kg/ha) (Fig. 45).

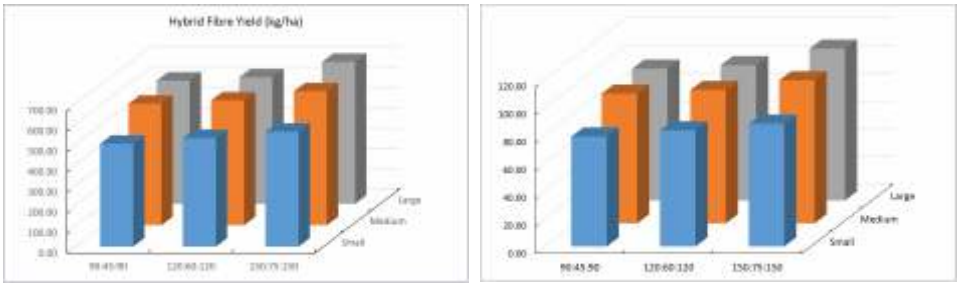


Fig. 45. Number of leaves harvested and fibre yield (kg/ha) of hybrid sisal

3.3 Demonstration trials of jute-green gram and jute-black gram technologies

A.K. Chakraborty and S. Mitra

Exploratory Trial

Green gram (*cv* Virat) @ 7.5 kg/ha, black gram (*cv* PU-31) @ 7.5 kg/ha, black gram (*cv* VBN 10) @ 7.5 kg/ha were broadcast sown as mixed crop with jute (*cv* JRO BA3) @ 3.5 kg/ha on 14th March in plots of size 35m × 10m, 35m × 10m and 20m × 10m, respectively. Harvested green gram pods at 65 DAS fully in drought condition but rain hampered harvest of black gram pods at 75 DAS. Fibre yield in jute-green gram mixed cropping were 22 q/ha and green gram seed yield was 2.8 q/ha. Whereas in jute-black gram mixed cropping fibre yields were 25 q/ha and seed yield of black gram were around 1.5 q/ha of both types.

3.4 Expansion of flax area in pilot scale with improved technologies

S. Mitra, J. Mitra, C.S. Kar, S. Sarkar, S. K. Jha, S. K. Pandey, R.K. Naik, K. Das and S.P. Majumder

Project Code: In house project-JA.8.4

The project was initiated to identify the suitable areas for flax cultivation in the country and to conduct demonstrations on improved flax cultivation in farmers' fields at a pilot scale for popularising the fibre flax crop among the farmers. The project aims at developing linkage with the industry and creating awareness on the scope of commercial cultivation of the flax crop in the country. It also aims at developing location-specific technologies for augmenting fibre yield at farmers' field conditions. Accordingly, a field experiment had been conducted at ICAR-CRIJAF, Barrackpore, to develop an integrated nutrient management schedule for fibre flax to enhance fibre yield and also to substitute chemical N doses through organic sources like FYM and biofertilizer (*Azotobacter*). The experiment comprised 07 treatments: T_1: control; T_2: 50% NPK; T_3: 50% NPK + FYM @ 5 t/ha; T_4: 50% NPK + FYM @ 5 t/ha + *Azotobacter*; T_5: 50% NPK + FYM @ 10 t/ha; T_6: 50% NPK + FYM @ 10 t/ha + *Azotobacter;* and T_7: 100% NPK, respectively. The experimental data revealed that the fibre yield of flax recorded with 100% NPK (inorganic) (16.96 q/ha) was statistically at par with the fibre yield recorded with the INM treatments (50% inorganic NPK + FYM @ 5–10 t/ha + *Azotobacter*) (15.42–17.44 q/ha) (Fig. 47). An almost similar trend was observed in the case of plant height (Fig. 47) while the variation in basal diameter due to fertiliser application was found non-significant (Fig. 47). All the INM treatments recorded 32.9–43.9% higher plant height and 85.5–109.9% higher fibre yield over the control treatment (85 cm & 8.31 q/ha) (Fig. 46).

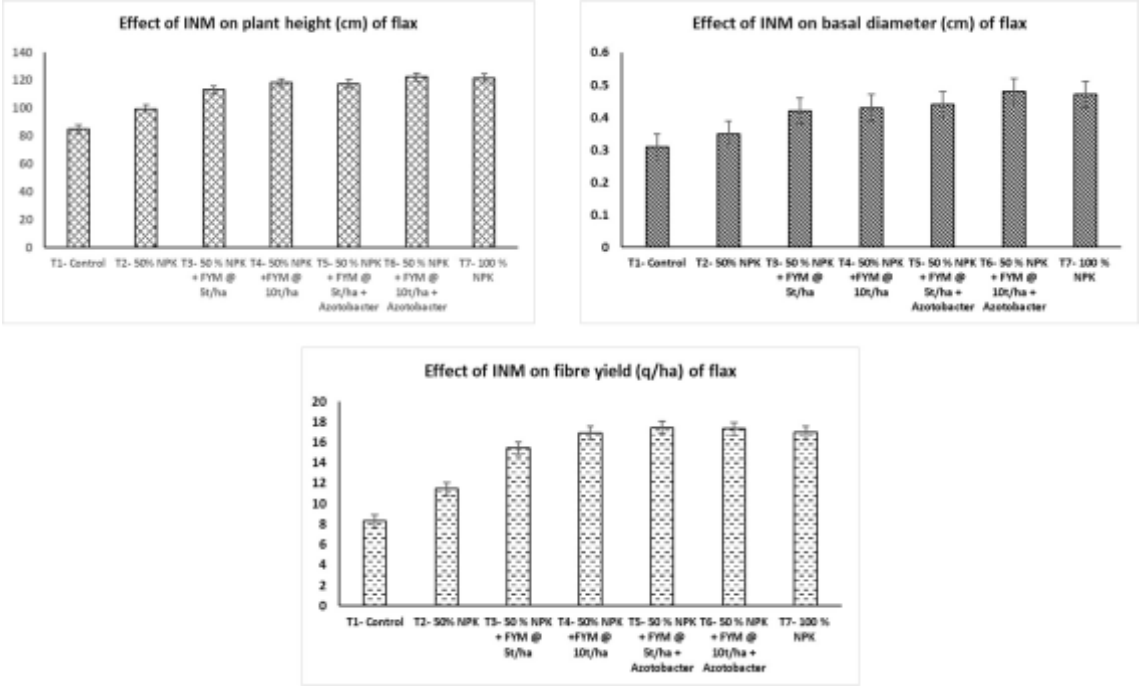


Fig. 46. Effect of INM on plant height, basal diameter and fibre yield of flax

3.5 Analysis of yield gap and contribution of production factors in cultivation of jute

S.K. Jha, M.L. Roy, S. Mitra, R. Saha, S.P. Mazumdar, R.K. Naik and A.K. Chakraborty

Project Code: In house-Project -JEXA 6.1

The study was conducted to assess the overall technology gap as well as the extension gap in jute fibre production in West Bengal, Assam, Bihar, Odisha, and Meghalaya (Fig. 47). In West Bengal, the extension gap was maximum at Murshidabad (07.67 q/ha) and Uttar Dinajpur (07.41 q/ha), while the technology gap was maximum at Malda (05.80 q/ha) and Dakhin Dinajpur (05.70 q/ha) districts. Similarly, in the case of Assam, the technology gap was found maximum at South Salmara (06.01 q/ha) and West Karbi Anglong (05.60 q/ha), while the extension gap was maximum at Bongaigaon (07.45 q/ha), followed by South Salmara (07.43 q/ha) district. In Bihar, the technology gap was maximum at Katihar (06.42 q/ha) and Madhepura (06.32 q/ha), while the extension gap was found maximum at Supaul (07.87 q/ha) and Araria (07.77 q/ha) districts. In the case of Odisha, the technology gap was maximum in the Cuttack (06.56 q/ha) district, while the extension gap was found maximum in the Jajpur (07.15 q/ha) district. In Meghalaya state, data from Tura showed that the extension gap was 07.11 q/ha while the technology gap was 6.61 q/ha. It has been observed that demonstration of the improved production technologies in the farmers' field has enhanced the jute productivity and has bridged the gap between farmers' practice yield and potential yield. The range of yield gap bridging in West Bengal was 52–74%; in Assam it was 53–67%; in Bihar 42.99–59.77%; in Odisha 48–54%; and in Meghalaya it was 51%. This reveals that the gap between the farmers' practice yield and potential yield is being narrowed down by using the improved jute production technologies.

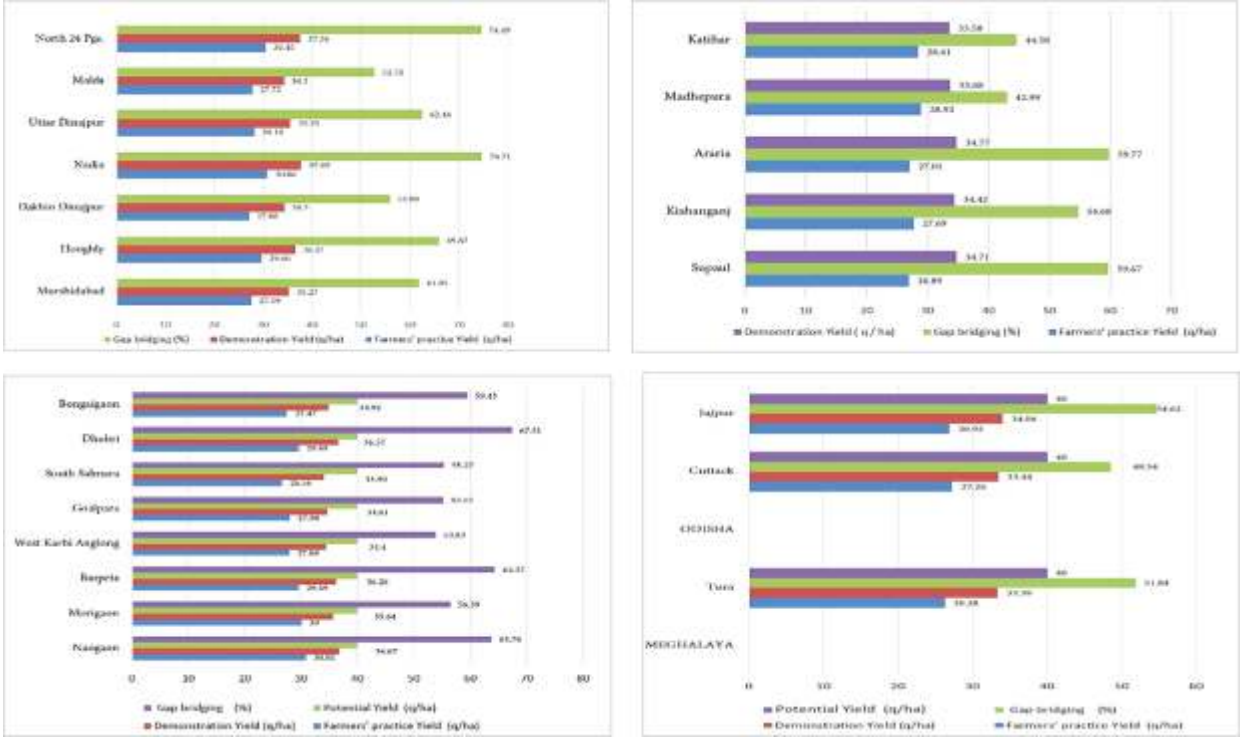


Fig. 47. Yield gap bridging in jute growing areas of eastern India

3.6 Minimizing yield gap and maximizing the income of jute-based farm families through cluster-based approach-a case study

M.L. Roy, S.K. Jha, Shailesh Kumar, Shamna A. and G. Kar

Project Code: In-house Project-JEXA 6.3

A study was conducted in Chandigar village (Gaighata, North 24 Parganas) of West Bengal to minimise yield gap and maximise the farm income covering an area of 50 ha. Through various extension interventions like FLDs, Farmer Field School (FFS), and agro-advisories, it was found that genetically impure/mixed jute seeds were almost replaced by genetically pure/HYV seeds. Improved farming practices like seed treatment, line sowing, and mechanical weed control were adopted by around 80%, 50%, and 50% of the farmers in the project area, respectively. Due to line sowing, the seed rate was reduced to half the quantity required for broadcasting. Around 70% of farmers used CRIJAF Sona for improved retting of jute, and fibre quality was improved by 1-2 grades. The yield of the jute fibre was increased from 26-28 q/ha to 30-32 q/ha, which had a scope to further increase, provided the absence of abiotic stress during the growth period of the plant. Farmers started supplying their quality jute fibre to Ichamoti FPC for value addition by farm women trained by ICAR-CRIJAF. Due to line sowing and mechanical weeding, the cost of cultivation has been reduced by ₹ 12000-15000/ha. As a result of reduced cost of cultivation, fibre yield and quality enhancement, and avoidance of middlemen for raw jute purchase, farm income is increased by ₹ 25000-30000/ha. The trained farm women who were involved in making jute diversified products and marketing through FPC contributed to their families around ₹3000-5000/month as off-farm income.

Fig. 48. Flow chart of the study

4. Post-harvest Management and Value Addition

4.1 Development of a minimal water retting technology of jute

B. Majumdar, G. Kar, S. Datta, and Debarati Datta

Project Code: External Funded Project –NASF project

The newly developed free flowing retting method was evaluated compared to stagnant water retting in concrete retting tank, *in-situ* retting and conventional retting methods which are in use for quite a time. The free flowing water retting method required only 7135 litres of water for 1 quintal dry jute fibre production compared to 25,840 litres in conventional retting method. The fibre recovery in free flowing water retting method was significantly higher by 7.5, 6.0 and 22.4% respectively, over stagnant water retting in concrete retting tank, *in-situ* retting and conventional retting methods. The post-

retting water quality characteristics like EC (0.54 dS/m), Ca^{2+} + Mg^{2+} (35.8 mg/l), BOD (45.1 mg/l), COD (157.6 mg/l), Chloride (4.2 mg/l) and hardness (65 mg/l) content recorded in free flowing water retting method were significantly lower compared to other retting methods (Table 18). Use of microbial retting consortium "CRIJAF SONA" accelerated the retting process and reduced the retting duration by 6 to 10 days in improved retting methods along with improvement in fibre quality parameters. The higher fibre strength of 26.5 g/tex, the lowest root content (2.3%) and defects content (0.55%) of jute fibre obtained under free flowing water retting method suggests its supremacy over other retting methods under study.

Table 18. Water requirement, retting duration and jute fibre yield under different jute retting methods

Sl.	Retting method	Retting duration (days)	Fibre yield (q/ha)	Plant: water ratio	Water requirement (L) per q raw jute stem for retting	Water requirement (L) per q jute fibre production
1.	Free flowing water retting	10	35.5	1:6.7	675	7135
2.	Stagnant water retting in concrete tank	14	33.0	1:9.8	980	11136
3.	In-situ retting	13	33.5	1:11.3	1130	12640
4.	Conventional retting	20	29.0	1:20.0	2000	25840
	CD (p=0.05)	2.4	1.85	-	220	780

4.2 Jute-Improved Cultivation and Advanced Retting Exercise (Jute-ICARE)

B. Majumdar, S. Satpahty, S. Mitra, S. Sarkar, S. K. Sarkar, S. K. Jha, S. Datta, K. Mandal, A.K. Singh, R.K. Naik, Shamna A., M.L. Roy, S. Saha and G. Kar

Project Code: External Funded Project – JUTE-ICARE

The Phase-X of the Jute-ICARE project was carried out in 240 blocks in W.B., Bihar, Assam, Odisha, Meghalaya, Andhra Pradesh, Jharkhand, Nagaland, and Andhra Pradesh states, covering a 225,000 ha area involving 5.0 lakh farmers during 2024-25 in collaboration with the National Jute Board (NJB) and Jute Corporation of India (JCI). About 600 MT of certified seeds of jute (cv. JRO 204, JBO 2003H, CO-58, JBO-1, JROM-1, & JRC-532) and 800 nos. each of CRIJAF multi-row seed drills and CRIJAF single-wheel jute weeders were distributed among the farming community. During retting season, 650 MT of CRIJAF Sona were distributed among the farming communities for improved retting of jute and mesta. For the consecutive second year, about 500 nos. of crop cutting experiments (CCE) were also conducted in West Bengal, Assam, Bihar, and Odisha under the technical guidance and supervision of scientists of ICAR-CRIJAF. Three in-house trainings on "Improved Production Technology for Quality Jute Fibre Production" were conducted for 60 block supervisors and master trainers of West Bengal, Bihar, Assam, Odisha, and Meghalaya. Altogether, 500 demonstrations of sowing, weeding, and improved retting were conducted by the master trainers and block supervisors across the country. The quality check of samples of CRIJAF SONA received from two licensed farms, 'Bengal Biotech and Research', Panskura, and 'Next to Nature', Guwahati, was carried out at ICAR-CRIJAF laboratory before the distribution of 650 MT CRIJAF SONA to the farming community. During the year,

soil samples collected from the jute-growing districts of West Bengal were analysed, soil maps were prepared, and soil health cards were prepared for the farming community of Hooghly districts for distribution.

Fig. 49. Improved Retting with CRIJAF SONA and production of quality golden fibre by farmers under Jute-ICARE

4.3 Technologic and economic empowerment of SC farm families to mitigate the impact of Covid-19 through jute based farming, value addition and value chain establishment

Shamna. A, G. Kar, R.K. Naik, N.M. Alam and S.P Mazumdar

Project Code: External funded project-DST SEED Project

The project was initiated in the year 2021 with the objective of improving the socio-economic status of farmers during the post-COVID period by promoting the best package of practices of jute-based farming, the value chain in jute, and entrepreneurship among farm women for undertaking the activities in the value chain. Average jute production in the project area has increased from 32 q/ha to 38 q/ha as a result of the adoption of improved jute production technologies. Farm women's empowerment through increased income and reduced drudgery was given focus in the third year of the project.

The participation of farm women had increased in jute farming as well as value addition. Training and demonstration on improved jute cultivation practices, the use of the CRIJAF Multirow seed drill, the single-wheel jute weeder, and CRIJAF Sona powder for accelerated retting and quality fibre were given to farmers and farm women. Drudgery reduction was quantified among the demonstrated technologies by measuring the total cardiac cost of work and energy efficiency ratio and was found that the drudgery reduction was 11 percent in the case of retting using CRIJAF Sona, 15.04 percent in the case of the single-wheel jute weeder, and 0.73 percent in the case of sowing using a multi-row seed drill.

Fig. 50. Demonstration for operation of single-wheel jute weeder by farm women for drudgery reduction

Thirty numbers of farm women were trained on making jute-diversified products during the year 2024. There was a steady increase in income among the SHG group members from the production of jute diversified products. The annual income of the SHG group from jute-diversified products was recorded as ₹ 7.2 lakhs. Constraints faced by farm women in escalating the jute bag-based microbusiness were analysed, and rank-based quotients were calculated for the constraints. Finance or liquidity, high competition in the market, and lack of facilities for large-scale production of bags were the most important constraints identified.

Fig. 51. Value chain establishment through production of jute diversified products by the farm women

5 Mechanization and Energy Management

5.1 Development and performance evaluation of jute ribboner

R.K. Naik, C.S. Kar, S. Mitra, S.K. Jha and G. Kar

Project Code: In-house Project-JAE 3.6

The power-operated jute ribboner machine is developed for the extraction of jute ribbon from freshly harvested jute plants without breaking sticks (Fig. 52). It is powered by a single-phase 3 hp electric motor and can be operated by a 5 hp diesel engine with slight modification. It consists of two sets of stick breaker-cum-ribbon-pulling units placed one above the other. It has two input chutes so that two operators can work simultaneously at a time. Five to six jute plants can be fed in one set of breaker units; thereby, 10-12 plants can be extracted at a time by two units. The principle involves feeding jute plants by the butt end in between the upper breaking rollers, which crushes the stick about 5 cm, and then pulling the ribbon by the lower rollers at high speed and placing the ribbon on the conveyor belt for delivery at the front/side of the machine. The sticks of the feeding plants ejected intact from the upper tray of the machine. The jute plant processing capacity of the machine is about 4000-5000 plants per hour with fibre extraction efficiency of more than 90%. While the traditional whole plant retting yields about 5-6% fibre, ribbon retting improves the yield to about 7-8% on green biomass.

Fig. 52. Jute Ribboner developed by ICAR-CRIJAF

5.2 Functional performance evaluation of tractor drawn multi-crop seed drill

R.K. Naik, C. S. Kar, G. Kar, S. Mitra and S.K. Jha

Project Code: In-house Project-JAE 3.6

The multi-crop seed drill machine is developed for sowing of jute and other small-seeded crops, e.g., millets, mustard, sesame, etc., using an inclined plate metering mechanism (Fig. 53). It is operated through a 3-point linkage of a tractor. The working width of the machine is 1.75 m, consisting of 7 rows, and the row spacing is 25 cm. The row-to-row spacing can be adjusted as per the requirement of different crops. The functional performance evaluation of the machine was carried out at a forward speed of 2.0-2.5 km/h to minimise missing index. The seed rate for sowing of jute was found to be 3.66 kg/ha with average depth of seed placement of 10-15 mm. The effective field capacity and field efficiency of the machine were found to be 0.36–0.38 ha/h and 83–85%, respectively. The uniformity of seed dropping and spacing along the row was found to be 80-85% and 30-50 mm, respectively. Sowing of jute in rows followed by mechanical weeding using a manual weeder reduces manual labour requirements by up to 60% and saves costs of about Rs. 6500-11,500/- per ha. The performance of the seed drill is superior in terms of time and cost requirements for sowing seeds than a manually driven seed drill machine. The tractor-drawn, multi-crop seed drill not only reduces seed rate but also reduces the drudgery in sowing of small-seeded crops.

Fig. 53. Tractor drawn multi-crop seed drill

5.3 Development and performance evaluation of battery operated weeder for up-land crops

R.K. Naik, C. S. Kar, G. Kar, S. Mitra and S.K. Jha

Project Code: In-house Project-JAE 3.6

The battery operated weeder is developed for efficient weeding operation in up-land row crops (Fig. 54). It consists of frame, soil working unit, lugged drive wheel, battery (12 volt), DC motor, chain & sprocket, wires and accelerator etc. The speed of operation is controlled through the accelerator fitted on the right hand handle of machine. It can be operated as per the walking capacity of the operator walking behind it. During the operation the spring loaded soil working tool attached in the frame removes the weeds in between the rows of the crops. The spring controls the depth of operation of weeding tool. The field capacity of weeder was found to be in the range of 0.06-0.07 ha/hr with weeding index of 83-85 per cent. It increases field efficiency and reduces drudgery in weeding operation.

Fig. 54. Battery operated weeder for upland crops

5.4 Assessment of newly designed Modified CRIJAF Nail Weeder in broadcast jute field

A.K. Chakraborty, D. Datta and N.M. Alam

Exploratory Trial

Trials conducted in sandy loam and clay soil of CRIJAF Research farm (area 9m × 9m). Jute seeds (*cv* JRO BA3) @ 5.0 kg/ha broadcast sown on 2 April and 25 April, respectively, followed by irrigation, running modified nail weeder twice (first at 8 DAS in one direction and at 12 DAS in crisscross direction), hand weeding once (at 30 DAS). Other recommended management practices were uniformly followed in both the trials. Plants were harvested at 120 DAS. In sandy loam soil, plant density was 47 plants/m^2 and 39.3 q/ha fibre yield with plant height-wise shares of 53.6% large (>300 cm), 22.2% medium (250-300 cm) and 7.3% small (150-250 cm). In clay soils, fibre yield was 38.8 q/ha.

Fig. 55. Weed management in jute field using modified CRIJAF Nail Weeder

CROP PROTECTION

Overview

Productive agriculture systems are always vulnerable to hazards of climate, pests and diseases causing threat to crop production. In the changing climatic scenario, the crops are facing a wider range of pests and disease outbreaks and making the JAF crop production unstable. The Crop Protection Division takes up study on the incidence and crop losses caused by pests and pathogens, etiology and epidemiology of diseases, bio-ecology, biology of pests and developing integrated management schedules. The division is exploring new frontiers of research that may result into the development of appropriate technologies for jute and allied fibre crop protection which are effectively productive, eco-friendly, sustainable, and economically profitable.

Priorities & Thrust Areas

- Insect pests-plant interaction and the pathogen system in JAF crops
- Investigation on PGPR and biocontrol for pest and disease management in JAF crops
- Ecological behavioural and epidemiological studies on pests and diseases of JAF crops
- Standardization and validation of IPM technologies in JAF crops
- Exploring the ICT and related tools for pest management and pest forecasting in JAF crops.

Research Highlights (2024)

- The germplasm lines OIN 148 and OIN 852 showed significant resistance to stem rot disease in jute, indicating their potential use as a source of resistance in future jute breeding programs.
- Spiromesifen and fenpyroximate suppressed the mite population significantly. Neem formulation at 10,000 ppm concentration and pongamia insecticidal soap combined with mineral oil proved effective in controlling jute mite infestations.
- Soil application of sulfur and foliar spraying of chlorantraniliprole (18.5% SC) was found to be the most effective treatment against the indigo caterpillar pest in jute crops.
- An integrated pest management (IPM) approach using a combination of seed treatment followed by spraying of an acaricide, insecticide and fungicide provided the best overall control, resulting in the lowest incidence of stem rot, yellow mite, and semilooper infestations.
- The life cycle modeling of mealybug was done using temperature as an explanatory variable. The optimal temperature for development was 34–35°C, while the lowest mortality occurred at 33°C.
- Predictive models were developed based on weather parameters as independent variables to forecast peak populations of major jute pests including yellow mite, jute semilooper, and hairy caterpillar.

1. Host Pathogen Interaction

1.1 Phenotypic and physiological variation up on stem rot pathogen inoculation in jute

K. Mandal, D. Barman, S. Mitra, G. Kar, T. Kumar and P. K. Das
Exploratory Research Programme

Physiological changes in two susceptible jute cultivars, JRC-412 (*C. capsularis*) and JRO-524 (*C. olitorius*) were monitored. The plants were inoculated with a virulent isolate of stem rot causing fungus, *Macrophomina phaseolina* (CJMR 17). Each plant was inoculated at the mid-length of stem following a stem-tape technique. Inoculation was done in staggered manner so that at the time of data recording plants were at 2, 4 and 7 days after inoculation (DAI). Inoculated plants gradually developed stem lesions. The lesion originated from the site of inoculation, initially it was water soaked lesion at the growing front. As the lesion increased in size, the older portion of the lesion turned necrotic. Lesion length was significantly larger in JRC-412 compared with those of JRO-524 (Fig. 56). As the lesion size increased the plants expressed symptoms of water stress with drooping of leaves, loss of turgidity and drying of leaves (Fig. 56). Leaf membrane stability was disrupted as the stress symptoms increased resulting into electrolyte leakage from the cells. Accordingly, membrane stability index changed significantly from 4 DAI and maximised at 7 DAI (Fig. 57). Leaf relative water content (RWC) also decreased gradually. Significant difference was observed at 4 DAI onwards (Fig. 57). Leaf photosynthesis rate was adversely affected. The white jute plants were severely affected as more than 95% decrease was observed at 2 DAI itself. The decrease was 44.8% at the similar time frame in case of tossa jute. However, at 4 DAI onwards carbon assimilation rates were minimal in both the cultivars. Dark respiration of the leaves gradually increased with the stress and became very low at 7 DAI. This implies that with the increase in lesion length and associated stress, net carbon fixation by the leaves turned negative.

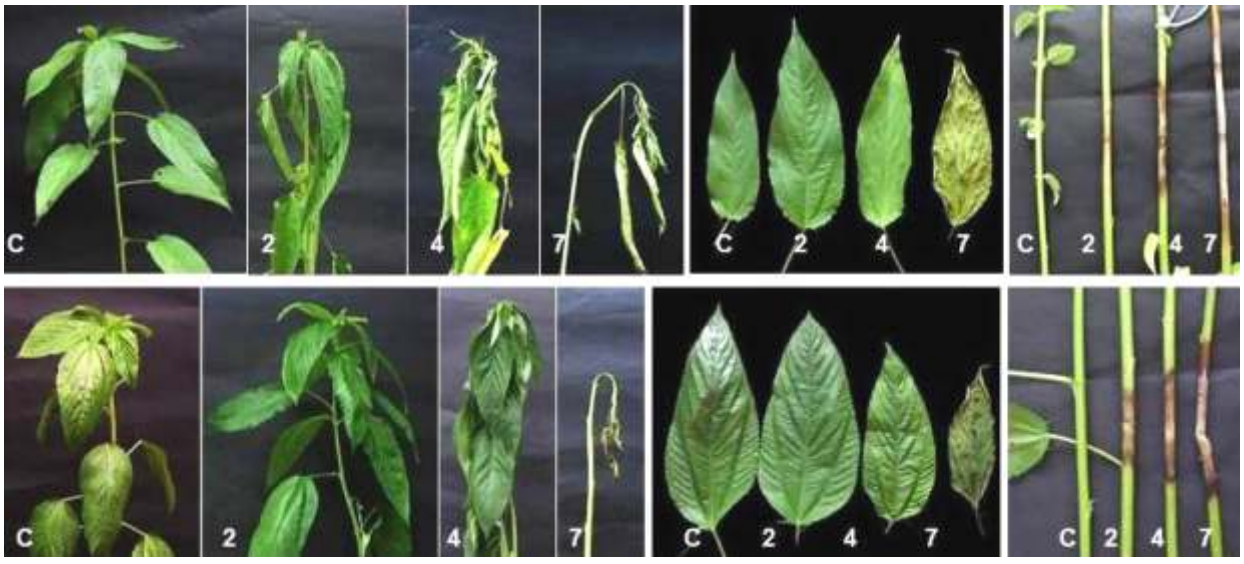


Fig. 56. Phenotype of *C. capsularis* (upper panel) and *C. olitorius* (lower panel) plants upon inoculation with *Macrophomina phaseolina*. C= control, 2= 2 DAI, 4= 4 DAI, 7= 7 DAI

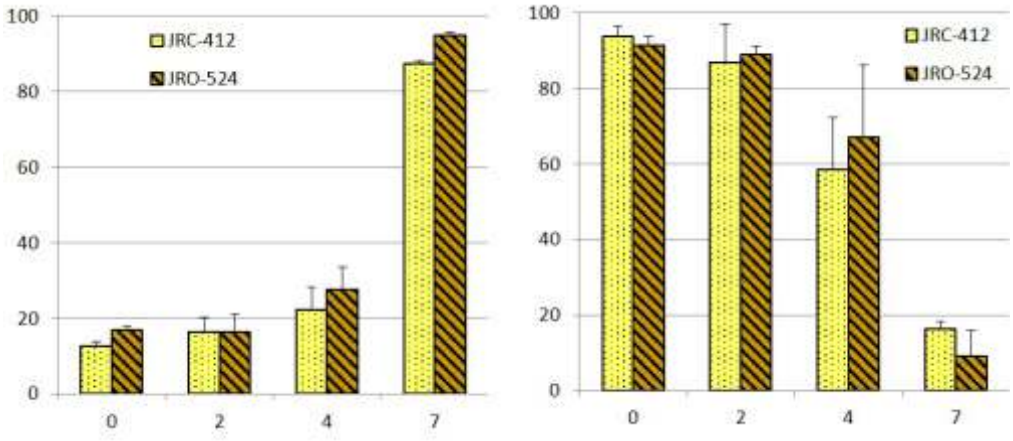


Fig. 57. Membrane stability index and leaf relative water content jute plants upon inoculation with *Macrophomina phaseolina*. 0, 2, 4 and 7 indicate days after inoculation.

1.2 Assessment of stem rot tolerance based on host-pathogen interaction at individual plant

C. Biswas, D. Barman, N.M. Alam, Thribhuvan R. and P. Sinha

Project Code: Institute Project-JM 9.6

The major objectives of the project are phenotyping stem rot resistance in jute based on digital image processing (RGB/ hyperspectral images) and detection of jute stem rot disease by applying deep learning networks for disease forecasting. During the last crop season RGB images of stem rot lesions from jute field were taken for host pathogen interaction to assess tolerance to the disease.

Relative tolerance in terms of lesion area could be used to estimate relative resistance among the genotypes based on the following formula:

Relative resistance (for lesion area) = 1- lesion area of test genotypes/lesion area of the most susceptible genotypes.

Based on threshold technique infected portion was separated for estimation of lesion area for comparison among different genotypes for stem rot response (Fig 58, Table 19). Maximum susceptibility relative tolerance could be assessed for large number of genotypes.

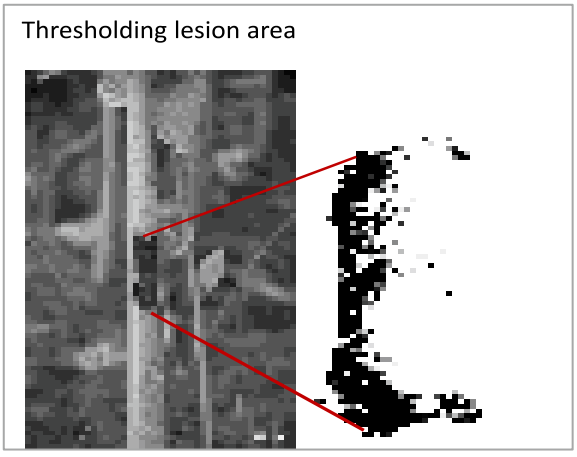


Fig. 58. Lesion area estimation for assessment of relative tolerance to stem rot

Table 19. Mean area and threshold area of selected images (in pixel)

Image	Mean area	Threshold area
1	8777.701	30606.14
2	12977.84	43508.77
3	1785.957	9314.702
4	6015.608	5234.689
5	5899.733	7372.800
6	3713.4	4055.04
7	509.94	939.36
8	639.39	1013.76
9	2765.52	3013.76
10	2682.96	5443.20

2. Host Plant Resistance

2.1 Screening of segregating population of jute stem-rot resistance

K. Meena, K. Mandal, Thribhuvan R and S. Dutta

Project Code: In-house Project - JBT5.0

Stem rot disease causes significant losses to jute cultivation. Due to the complex nature of the disease, it is difficult to manage under field conditions. The cultivation of resistant cultivars is one of the low-cost and effective technologies. Screening for resistant sources and understanding genetic inheritance are essential to make progress in this direction. From a segregating F2 generation, 219 plants, including two parents, were inoculated with a virulent isolate of *M. phaseolina*. Lesion length was measured after two days. Based on the data, the population could be divided into susceptible and resistant (Fig. 59).

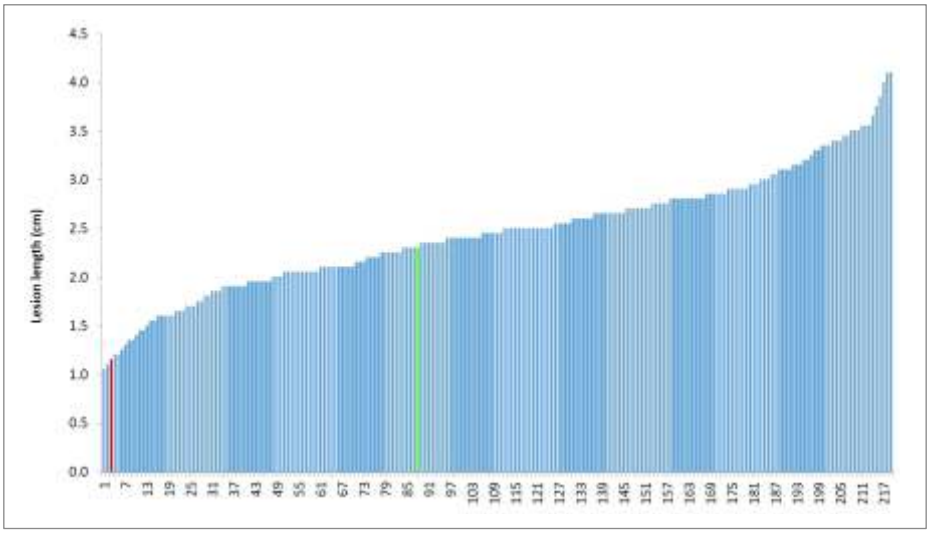


Fig. 59. Lesion lengths on segregating F2 lines. The resistant and susceptible parents are marked in red and green, respectively

2.2 Identification of donor of stem-rot resistance in jute under natural epiphytotic

S.K. Sarkar and K. Mandal

Project Code: In-house Project- JM 9.5 (S)

Macrophonina phaseolina, the causal agent of stem rot of jute is the most important diseases of jute causing around 20% loss in fibre yield. The disease is very difficult to manage because of its nature as well the ecology of jute crop. The best option is to use of resistant varieties which require source of resistant germplasm. Under this backdrop one hundred seventy selected germplasms were tested both at Barrackpore (sick plot) and Sorbhog (hotspot) against stem rot of jute (*Macrophomina phaseolina*) during 2021 and 2022. Out of these fourteen gemplasm namely OIN-852, OIN-148, OIN-201, OIN-118, OIN-159, OIN-119, OIJ-77,OIN-113,OIN-197,OIN-154, OIN-140, OIN-167, OIN-176, OIN-209 were selected based on their less incidence of stem rot and tested in sick plot as well as screened under artificial condition using stem inoculation method at Barrackpore during 2023 and five germplasm namely OIN-852, OIN-148, OIN-201, OIN-159 and OIN-113 were selected. These five

germplasms were again tested under sick pot with artificial inoculation technique during 2024. The result showed that OIN 148 and OIN 852 are more resistant in restricting stem rot which may be used as source of resistance for further breeding program to develop resistant variety against stem rot of jute.

Fig. 60. Artificial inoculation techniques in stem rot of jute (*Macrophomina phaseolina*)

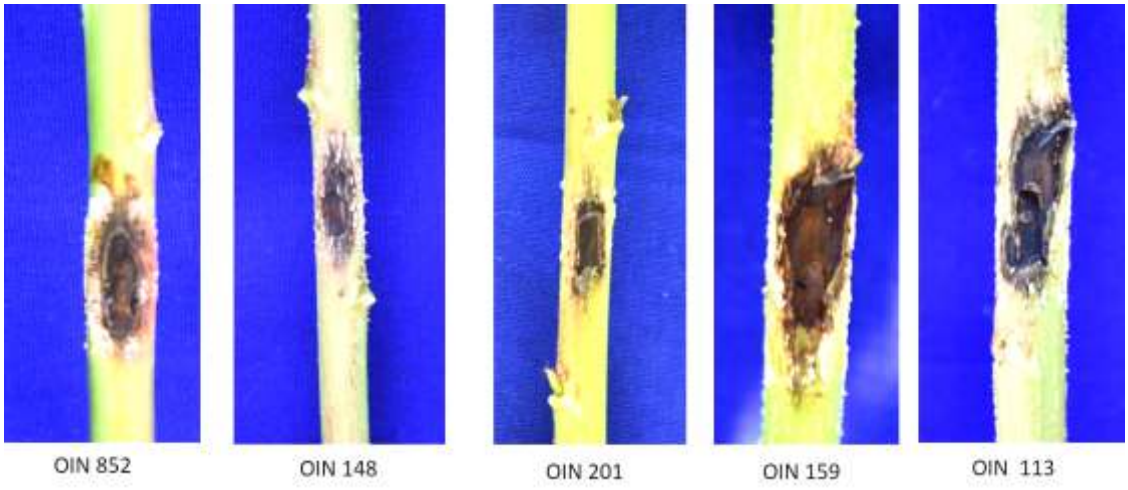


Fig. 61. Disease reaction in different germplasm against stem rot of jute in artificial method (stem inoculation method)

3. Bio Ecology and Management of Insect Pests and Diseases of JAF Crops

3.1 Integration of promising technologies for management of insect pests of jute in on-farm jute production system

S. Satpathy
Exploratory Research Programme

Evaluation of botanicals and bio rational insecticides against yellow mite of jute under glass house condition: The bio-rational pesticides have moderate toxicity on the target pests hence are safer for natural enemies and improve the sustainability of the pest management approach. Compatible pesticides of diverse sources have the potential for better performance against the insect pests by exploiting their synergistic effects. Botanicals and agriculture grade mineral oils are ideal combinations for bio rational pesticides.

The effect of botanicals and bio-rational insecticides was evaluated under glass house condition against jute yellow mite. The potted plants of jute (Cv. JRO - 524) were uniformly sprayed twice at 40 and 50 DAS by automizer before counting the population level of mite. The pre-treatment mite population varied from 38.10 to 43.44 mite/cm^2 which reduced significantly after the spray (Table 19). During the first observation after treatment at 2 days after the spray significantly lowest mite density (0.11/cm^2) was recorded in spiromesifen treatment followed by fenpyroximate (0.33/cm^2). In these two treatments the mite population was reduced significantly over all other treatments.

Table 19. Effect of botanicals and bio rational insecticides on yellow mite under glass house condition

Treatment	Mite density/cm^2 of leaf		
	Pre-treat	Post-treat	Post-treat
T1 Neem soap (5g/l)	41.10^{a}	20.60^{b}	9.55^{cd}
T2 Pongamia soap (5g/l)	39.99^{a}	22.99^{b}	12.77^{bc}
T4 Neem soap + mineral oil (5 g +2 ml /l)	38.10^{a}	14.44^{cd}	9.22^{cd}
T5 Pongamia soap + mineral oil (5 g +2 ml /l)	40.21^{a}	13.55^{cd}	12.00^{bc}
T6 Fenpyroximate 5% EC (1.5 ml/l)	38.66^{a}	0.33^{f}	1.00^{f}
T7 Spiromesifen 22.9% SC (0.8 ml/l)	40.10^{a}	0.11^{f}	1.00^{f}
T8 Mineral oil (2ml/l)	43.44^{a}	20.21^{b}	13.33^{b}
T9 Neem(Azadirachtin10000ppm) + Mineral Oil (2.5 +2 ml/l)	40.66^{a}	8.66^{e}	5.22^{e}
T10 Neem (Azadirachtin 1%) 10000 ppm 2.5ml/l	39.66^{a}	15.66^{c}	7.99^{de}
T11 Control	38.10^{a}	36.88^{a}	32.55^{a}
CD (P=0.05)	NS	3.60	3.33

Potential toxicity of bio-pesticides and botanicals against hairy caterpillar under laboratory condition: The toxicity of Bt formulations, botanicals (Karanjin, plant-based insecticidal soaps) and safer insecticides was determined under laboratory condition on 3rd instar larvae of hairy caterpillar at 24 and 48 hrs after treatment (Table 20). All the insecticides and bio-pestcides were treated at half the recommended field dosage. Highest toxicity causing 96 to 100% mortality was recorded in spinosad and spiromesifen treatments which was par with dextrose based Bt formulation (96%). The toxicity of karanjin 2EC (active ingredient of pongamia), talc based Bt formulation and spiromesifen were at par with 80%, 86% and 83% larval mortality respectively.

Integration of varieties and soil S application in on-farm jute production system for augmenting the protection against insect pests of jute: The on-farm field experiment was conducted at 3 locations of Belleshnakarpur village. The prevalent cropping system among the farmers are jute-vegetables/potato-onion, jute-rice-lentil/mustard and jute-vegetables-lentil/mustard. Most of the farmers grow JRO 204, JRO 524, CO 58 and JROBA 3 varieties of jute. Except seed treatment with carbendazim for stem rot, most of the farmers do not adopt any plant protection measures. The crops like tomato, onion, okra and other weeds act as alternate hosts for the insect pest of jute. The sulphur content of the soil of the experimental area varied from 3.79 to 5.09 ppm. The pre-sowing soil pH of the soil was 6.18 to 6.44.

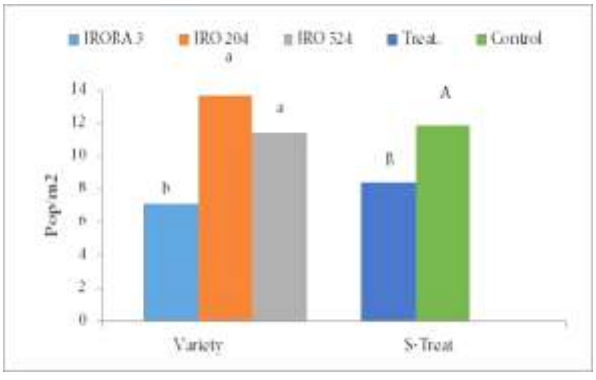
Table 20. Effect of bio-pesticides and botanicals on mortality of jute hairy caterpillar larvae

Treatment	Mortality (%)	
	24 hrs	36 hrs
T1 Bt formulation (dextrose) @1ml/l	70.00 *(56.99)^{b}	96.67 (83.85)^{a}
T2 Bt formulation (talc) @1ml/l	63.33 (52.77)^{b}	86.67 (68.85)^{b}
T3 Karanjin 2 EC @ 3 ml/l	43.44 (41.15)^{c}	80.00 (63.93)^{b}
T4 IIHR-insecticidal neem soap @1.5ml/l	26.67 (30.99)^{d}	30.00 (33.00)^{c}
T5 IIHR-insecticidal Pongamia soap@1.5ml/l	33.33 (35.21)^{cd}	46.67 (43.07)^{c}
T6 Spiromesifen 22.9% SC @ 0.4ml/l	36.67 (37.22)^{cd}	83.33 (66.14)^{b}
T7 Spinosad 45 EC @ 0.2 ml/l	83.66 (66.14)^{a}	96.67 (84.85)^{a}
T8 Spinoteram 11.7 SC @ 0.6 ml/l	86.67 (68.85)^{a}	100.00 (90.00)^{a}
CD (P=0.05)	7.19	11.27

**Figures in the parenthesis are arc sine transformed values*

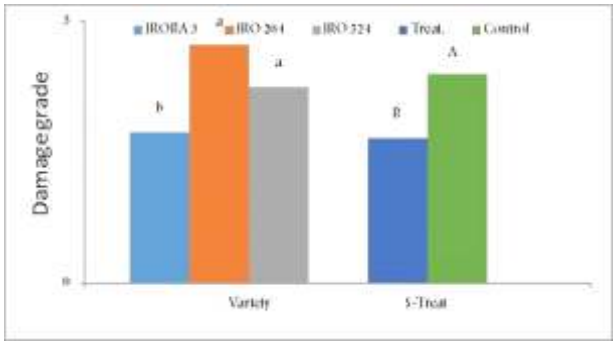
The performance of moderately mite-resistant variety JROBA 3 and JRO 204 integrated with soil S application and need based application of foliar insecticides was evaluated under on-farm jute production system for pest management as well as augmenting the yield. The infestation of indigo caterpillar (ICP) in the initial stage of crop establishment varied from 7 larvae/m^2 in JROB 3 to 13.66 larvae/m^2 in JRO 204 (Fig 62 & 63).

Fig. 62. Effect of integrated treatments on ICP population



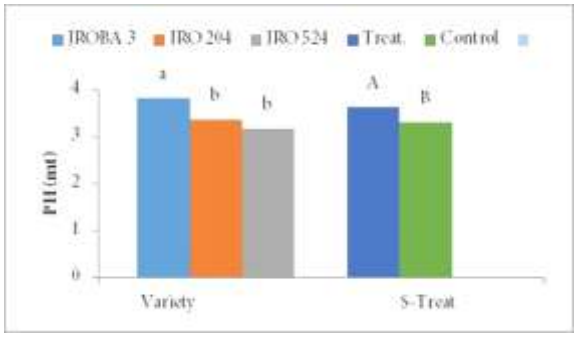
The treatment of soil S and foliar spray of Chlorantraniliprole (18.5% SC) @ 0.4 ml/l suppressed the pest infestation to 8.42 larvae/m^2 compared to 11.80/m^2 in control.

Fig. 63. Effect of integrated treatments on damage of ICP



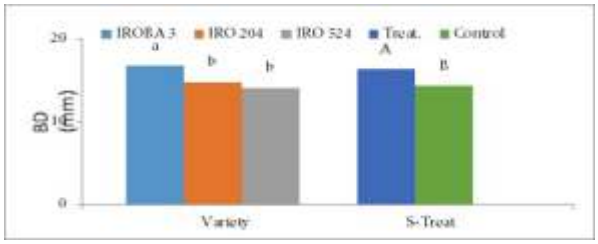
Irrespective of the varieties, the damage grade of ICP was significantly less in JROBA 3 whereas the soil S treatment showed lower level of damage grade compare to the control (Fig 64 & 65).

Fig. 64. Effect of integrated treatments on plant height



The effect of varieties and sulphur treatment was prominent on plant growth characteristics both on plant height and basal diameter. These parameters were significantly highest in the variety JROBA 3 treated with Soil S @ 40 kg/ha.

Fig. 65. Effect of integrated treatments on basal diameter of jute plants



3.2 Development of IPM module for jute and mesta

Rajib Kumar De, S. Satpathy, V. Ramesh Babu and A. Shamna

Project Code: In-house Project - JM 9.4

Theme based IPM module against major diseases and insect pests of jute: In a field experiment, theme based IPM modules were evaluated against major diseases and insect pests of jute cv. (JRO BA 3), in randomised block design (Table 21). Chemical IPM module consisting of seed treatment followed by one spray sequentially of acaricide, insecticide and fungicide was most effective with lowest stem rot (5.3%), yellow mite (21.5% and semilooper (1.6%) with highest fibre yield (40.6 q/ha) compared to check with farmers' own practice (32.3 q/ha) and untreated check (25.1 q/ha). In terms of efficacy, chemical IPM module was followed by biological control and cultural operation based IPM with fibre yield (36.5 q/ha) and (36.1 q/ha), respectively.

Table 21. Plant damage due to insect pests and diseases and yield under pest management modules in jute

IPM module**	Stem rot (%)*	Yellow mite (%)*	Semilooper (%)*	Yield (q/ha)
M1- Chemical based	5.3(13.3)	21.5 (27.6)	1.6 (7.2)	40.6
M2 - Biological based	6.0 (14.2)	31.5 (34.2)	2.4 (8.9)	36.5
M3 - Cultural based	6.5 (14.8)	30.8 (33.7)	2.5 (9.1)	36.1
M4 - Economic	6.2 (14.5)	34.0 (35.7)	2.7 (9.5)	36.2
M5 - Farmer friendly	7.1 (15.5)	31.1 (33.9)	2.8 (9.6)	34.7
M6 - Miscellaneous	8.1(16.5)	27.0 (31.3)	2.8 (9.6)	37.0
M7 - Actual practice	12.4 (20.5)	27.6 (31.7)	3.1 (10.2)	32.3
Untreated control	16.1 (23.6)	38.2 (38.2)	3.8 (11.3)	25.1
CD (P=0.05)	(2.0)	(1.8)	(1.1)	2.3
SE±m	(0.9)	(0.8)	(0.5)	1.1

**Figures in the parenthesis indicate the Arc Sine transformed values. ** M1 = Soil application of neem cake @ 50g/sq m, seed treatment with carbendazim @ 2 g + imidacloprid @ 4 ml/k, spraying of spiromesifen 240 SC @ 0.7 ml/litre, λ-cyhalothrin 5 EC @ 0.6 ml/litre, tebuconazole 250 EC (25.9% w/w) @ 1.0 ml/litre; M2 = 1kg Pseudomonas fluorescens in 100 kg FYM/ha, Trichoderma viride @ 10 g/kg, neem oil @ 10 ml/litre, BT formulation 3 g/litre, NSKE @ 10 ml/litre; M3 = Sunnhemp green manuring + deep ploughing, Hot water @ 52-55 °C for 2-3 minutes, pheromone traps @ 12 /ha, light trap with mercury lamp 1 /ha, destruction of egg masses/ larvae/ adults and infected plants; M4 = Hot water @ 52-55 °C for 2-3 minutes, neem oil @ 10 ml/litre, NSKE @ 10 ml/litre; M5 = carbendazim @ 2 g /kg and NSKE @ 10 ml/litre; M6 = Neem cake @ 50g/sq , carbendazim @ 2 g + imidacloprid @ 4 ml/kg, chloropyriphos @ 2 ml/litre; M7 = Ploughing + 2 manual weedings/ thinning @ 12-15 and 25-30 DAS, chloropyriphos @ 2 ml/litre.*

Development of IPM module of jute: In order to find an IPM module for jute, a field experiment was carried out in randomised block design with 6 treatments and three replications involving two IPM modules (M1 and M2) along with farmers' practice. It was observed that, highest stem rot (11%) was observed in check plot in variety JRO 2407. Lowest stem rot (1%) was recorded in case of JRO 204 followed by JRO 2407 (1.9%) in chemical IPM module. Lowest infestation of hairy caterpillar (0.8%) was observed in JRO 204 and followed by 0.9% in both JRO 204 and JRO 2407 with chemical IPM module, whereas highest was noted in check with JRO 204. Grey weevil was maximum (12.5 %) in check compared to lowest (2.1 %) of JRO 204 with chemical IPM module. Yellow mite was lowest (1.7%) in chemical IPM module compared to 20.3% in JRO 204 in check. Semilooper, was lowest (1.2 %) in case of chemical IPM module compared to maximum (6.2%) in checks. Highest dry fibre yield (34.3 q/ha) was obtained in chemical IPM module in JRO 204. Performance of bio based IPM module was distinctly lower than chemical IPM module in both the varieties with respect all insect pests and stem rot disease in jute (Table 22).

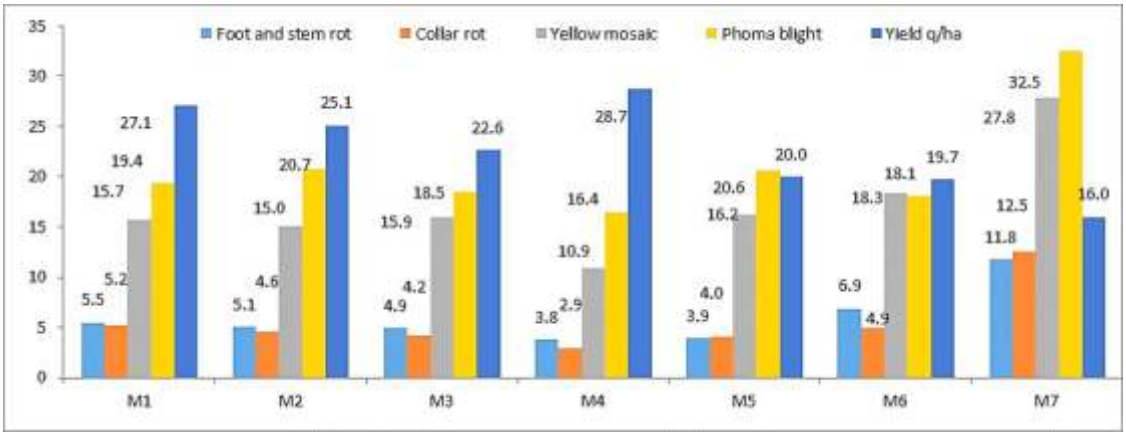
Table 22. Performance of chemical and bio-based IPM modules on incidence of stem rot and insect pests of jute

Treatments	Hairy caterpillar (%) infestation	Stem rot (%) infestation	Grey weevil (%) infestation	Yellow mite (%) infestation	Semilooper (%) infestation	Fibre yield (q/ha)
T1 V1M1	1.9 (7.9)	3.6 (11.0)	6.6 (14.9)	6.7 (14.9)	4.7 (12.4)	29.6
T2 V1M2	0.9 (5.2)	1.0 (7.5)	2.1 (8.0)	2.5 (8.8)	1.2 (6.4)	34.3
T3 V2M1	2.6 (9.2)	4.0 (11.5)	6.4 (14.6)	6.5 (14.6)	4.9 (12.7)	26.9
T4 V2M2	1.1 (5.6)	1.9 (7.8)	2.6 (9.0)	2.4 (8.7)	1.6 (7.3)	33.5
T5 V1M0	4.9 (15.6)	9.5 (17.9)	11.9 20.0)	20.1(26.6)	9.2 (17.5)	24.0
T6 V2M0	5.2 (13.1)	11.0(19.3)	12.5 (20.2)	19.7(26.2)	9.8(18.1)	24.2
CD (P=0.05)***	(2.6)	(1.6)	(3.21)	(2.2)	(2.6)	1.1
Factor M SE+m	(0.8)	(0.5)	(1.0)	(0.7)	(0.8)	0.1

Figures in the parenthesis indicate the Arc Sine transformed values. **Sowing on 28 March, 2024, V1=JRO 204 (Suren) and V2=JRO 2407 (Samapti). M_1 = Bio IPM (consisting of Soil application of Pseudomonas fluorescens + ST with Trichoderma + 1 spray of neem formulation @ 10000 ppm against mites and insects, etc.+ 1 spray of Bt formulation @ 10000 ppm against lepidopteran pests, etc.). M_2 = Chemical IPM (consisting of Soil application of Bleaching powder @ 30 kg/ha + ST with carbendazim 50 WP @ 2 g/kg and imidacloprid @ 4 g/kg seed + spraying of spiromesifen 240 SC @ 0.7 ml/lit at 35 DAS + spraying of tebucanazole @ 0.15% at 45 DAS against diseases, etc. + spraying of λ-cyhalothrin 5 EC @ 0.6 ml/l at 55 DAS against insects), M0= Control. * CDs (P=0.05) for factor V and VxM are NS.*

Evaluation of IPM module against major diseases of mesta: Various theme based IPM module against major diseases and insect pests of mesta was evaluated under field condition. In the chemical IPM module, percentage damage of all four diseases was lowest with 3.8% foot and stem rot compared to 11.8% in check with farmers' own practice, 2.9% collar rot compared to 12.5% in check, 16.4% phoma blight compared to 32.5% in check. Occurrence of yellow vein mosaic disease was 10.9 in chemical IPM module in comparison to 27.8 in check. In terms of fibre yield (q/ha), chemical IPM module with 28.7 q/ha was followed by organic IPM module (27.1), bio IPM module (25.1), miscellaneous IPM module (20) and easy IPM module (19.7) compared to 16 q/ha fibre yield in check (Fig. 66).

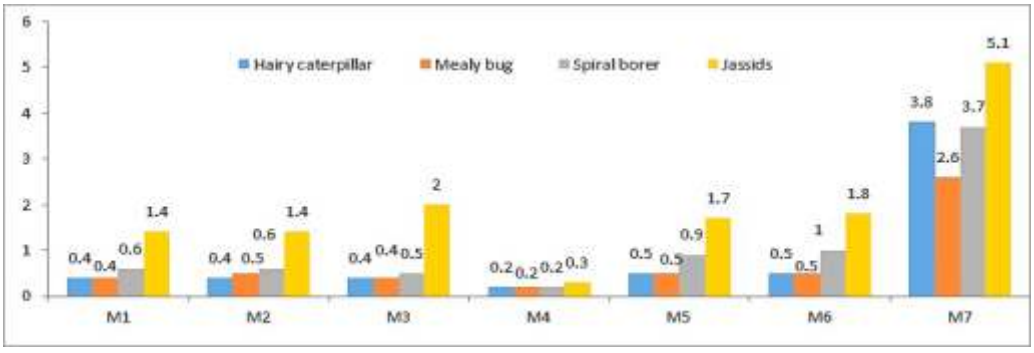
Fig. 66. Effect of IPM modules against major diseases of mesta



M1 = Soil application of neem cake @ 50g/sq m, spraying of Neemastra @ 1:2 ratio at 30 DAS, Bhamastra 25 ml/litre at 40 DAS, Agniastra 1:40 ratio at 50 DAS, Pheromone trap 10/ha; M2 = Green manuring, Trichoderma with cow dung, Trichoderma @ 10g/kg, spraying of neem oil 5-10 ml/litre at 30-35 DAS, BT formulation 2 ml/litre at 40 DAS, pheromone trap 10/ha, M3 = Vermicompost @ 3 tons/acre with equal quantity of cow dung, hot water treatment @ 70^{0}C for 1 min, destruction of egg masses/ larvae/ adults @ 7-10 day interval; M4 = Bleaching powder @ 30 kg/ha at 7 DBS, Metalaxyl @ 2 g + thiamethoxam 70 WS @ 5g @ 3g/kg, spraying of abamectin @ 2 ml/litre at 30 DAS, dimethomorph @ 3g/litre at 40 DAS, thiomethoxam at 50 DAS, Pheromone trap10/ha; M5 = Neem cake @ 50g/sq m, metalaxyl @ 2 g + thiamethoxam 70 WS @ 5g,spraying of neem oil @ 5-10 ml/litre at 30-35 DAS, thiomethoxam at 50 DAS, pheromone trap10/ha; M6 = Off-

IPM module against major insect pests of mesta: The chemical based IPM module was the best in managing all the major insect pests of mesta compared to all other modules evaluated with lowest percentage damage of all four insect pests. Hairy caterpillar was lowest with 0.2% compared to 3.8% in check with farmers' own practice, 0.2% mealy bug compared to 2.6% in check, 0.2% semilooper compared to 3.7% in check and jassids 0.3% compared to 5.1% in check (Fig. 67). Chemical IPM module also notched highest (78.8%) increase in yield over farmers' practice.

Fig 67. Effect of IPM module against major insect pests of mesta



M1 = Soil application of neem cake @ 50g/sq m, spraying of Neemastra @ 1:2 ratio at 30 DAS, Bhamastra 25 ml/litre at 40 DAS, Agniastra 1:40 ratio at 50 DAS, Pheromone trap 10/ha; M2 = Green manuring, Trichoderma with cow dung, Trichoderma @ 10g/kg, spraying of neem oil 5-10 ml/litre at 30-35 DAS, BT formulation 2 ml/litre at 40 DAS, pheromone trap 10/ha, M3 = Vermicompost @ 3 tons/acre with equal quantity of cow dung, hot water treatment @ 70^{0}C for 1 min, destruction of egg masses/ larvae/ adults @ 7-10 day interval; M4 = Bleaching powder @ 30 kg/ha at 7 DBS, Metalaxyl @ 2 g + thiamethoxam 70 WS @ 5g @ 3g/kg, spraying of abamectin @ 2 ml/litre at 30 DAS, dimethomorph @ 3g/litre at 40 DAS, thiomethoxam at 50 DAS, Pheromone trap10/ha; M5 = Neem cake @ 50g/sq m, metalaxyl @ 2 g + thiamethoxam 70 WS @ 5g,spraying of neem oil @ 5-10 ml/litre at 30-35 DAS, thiomethoxam at 50 DAS, pheromone trap10/ha; M6 = Off-season deep ploughing, green manuring, pheromone trap10/ha M7 = Farmers' own practice

4. Pest Informatics

4.1 Risk Assessment through modelling of major pests and diseases of jute under climate change scenario in India

N.M. Alam, D. Barman, S. Satpathy, S. Mitra, S.K. Sarkar and C. Chattopadhyay

Project Code: In-house Project- JE 2 .2

Insect infestation data were collected from various locations, including Coochbehar, Nagaon, and Bahraich. The correlation between different weather parameters—maximum and minimum temperature, relative humidity, and rainfall—and insect infestation was analyzed for the current week, one-week lag, and two-week lag periods. The analysis revealed that weather data with a two-week lag showed the highest correlation with insect infestation.

A forecasting model for BHC infestation was developed using an Artificial Neural Network (ANN), specifically a Multilayer Perceptron (MLP) with one hidden layer comprising four neurons and a hyperbolic activation function. The ANN model demonstrated superior performance compared to a simple regression model.

Hybrid models combining linear approaches (ARIMAX) and machine learning methods (SVM and ANN) were also employed for forecasting BHC infestation. Among these, the hybrid ARIMAX and Support Vector Machine (SVM) model outperformed the hybrid ARIMAX and ANN model (Table 23).

Table 23. Goodness of fit test of linear model

Model	AIC	BIC
ARIMAX (0,0,1)MaxT	8.32	12.43
ARIMAX (0,0,1)MinT	18.32	24.33
ARIMAX (0,0,1)RH-I	11.32	15.45
ARIMAX (0,0,1)RH-II	20.37	25.87
ARIMAX (0,0,1)RF	19.45	25.54
ARIMAX (0,0,1)MaxT,MinT,RH-I,RH-II,RF	21.45	28.65
ARIMAX (0,0,1)MaxT, RH-II	14.23	19.32

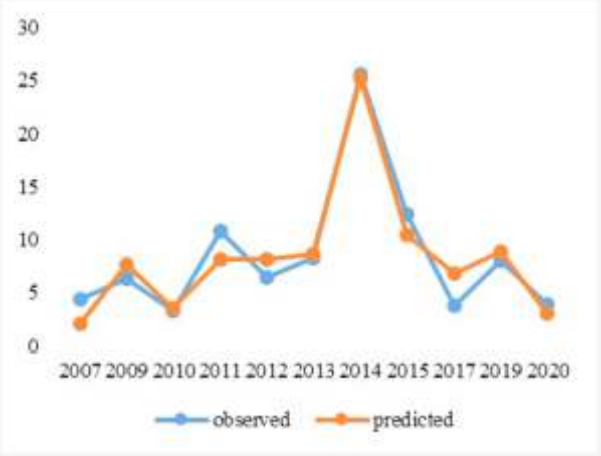
The life cycle modeling of mealybug was conducted using temperature as an explanatory variable. The development rate and mortality of mealybug were estimated using the Logan and Janisch models, respectively. It was observed that the optimal temperature for development was 34–35°C, while the lowest mortality occurred at 33°C.

Forecast models based on the weather parameters as independent variables was developed to forecast highest population of yellow mite, jute semi-looper and Bihar hairy catterpiller at each week starting from week of sowing by multiple stepwise regression. For Coochbhear the model to forecast highest population of yellow mite on jute (Fig. 68) obtained was:

Highest mites / sq cm =

$25.84039 + 0.00137^{*}Z_{RH(morn)^{*}RH(aft)} + 0.42441^{*}Z_{max\ tmp}$

Fig. 68. Highest population of yellow mite on jute per sq cm at Coochbehar



KRISHI VIGYAN KENDRA

Krishi Vigyan Kendra

Two KVKs namely KVK Burdwan and KVK North 24 Parganas (Additional) implemented various On Farm Trials (OFTs), Front Line Demonstrations (FLDs) and training programs for disseminating new agricultural technologies as well as improving skills of farmers, farm women, rural youths and extension workers. Other extension activities like exposure visits, field day, method demonstration, technology week, etc. of ICAR-CRIJAF and ICAR-ATARI were also conducted. KVK, Burdwan is presently serving two districts of Purba and Paschim Bardhaman after bifurcation of the erstwhile district of Burdwan.

The salient accomplishments of these KVKs are presented below.

1. On Farm Trials (OFTs)

The following OFTs were conducted by the KVK, Burdwan:

i) Improved weed management in jute

Application of Propaquizafop (10% EC) @ 1.5 – 2.0 ml/lt after 15 days + One hand weeding (TO-1) was found effective in controlling weeds in jute (weed density:12.7 no/m^2) while application of Fenoxaprop-p-ethyl (9% EC) @ 1.5 – 2.0 ml/lt after 15 days+one hand weeding (TO-2) was the second best option (weed density:16.4 no/m^2) and was at par with two hand weeding at 25 and 45 DAS (Farmers' practice) (weed density:16.9 no/m^2). Crop yield in TO-2 was 35.1 q/ha while in TO-1 and farmers practice, it was 32.3 q/ha and 32.6 q/ha, respectively. Cost benefit ratio in farmers' practice (B:C= 1.59) was lower as compared to TO-1 (1.92) and TO-2 (2.12).

ii) Improved weed management in jute-onion cropping sequence

The trial was initiated in Kharif 2023 and completed after onion harvest in March 2024. Results indicated that sowing of jute with seed drill followed by application of CRIJAF single wheel jute weeder + one hand weeding (TO-1). Yield of jute was significantly higher (35.4 q/ha) as compared to sowing of jute through broadcasting followed by application of CRIJAF single wheel jute weeder + one hand weeding; yield: 33.3 q/ha (TO-2) and Farmers' practice (sowing of jute through broadcasting followed by 2 hand weeding; yield: 31.7 q/ha). However, benefit: cost ratio in TO-1 (2.14) and TO-2 (2.04) were at par. In case of onion, application of pre-emergence herbicides (Oxyflourfen 23.5 EC) + weeding by CRIJAF single wheel jute weeder (2 times) resulted in significantly higher productivity (227 q/ha) as compared to one hand weeding + weeding by CRIJAF Nail Weeder (212 q/ha) and farmers' practice (three hand weeding, 215 q/ha).

The details of OFT conducted by the KVK, North 24 Parganas (Additional):

Crop/ Livestock	Title of the OFT
Paddy	Performance evaluation of high yielding early maturing rice varieties for Boro season.
Rice	Management of Yellow stem borer in Boro Rice
Tomato	Performance evaluation of tomato varieties Arka Rakshak, Arka Samrat, Kashi Adarsh
Garlic	Performance evaluation of garlic varieties- Yamuna Safed 3 & Yamuna Safed 5
Onion	Management of leaf blight and purple blotch of onion
Goat	Effect of area specific mineral mixture Kalmin
Poultry	Assessment of performace of Indian Runner, White Peking and Khaki Campbell ducks under backyard farming System'
Fisheries	Assessment of growth and production potential of Indian butter catfish in an IMC polyculture system
Fisheries	Assess the growth performance of air breathing fishes in jute retting ponds.

OFT activities by KVK, Burdwan

OFT activities by KVK, North 24 Parganas (Additional)

2. Frontline Demonstrations (FLDs)

A total of 375 FLDs were conducted by both the KVKs during 2024 on various crops like paddy, jute, tomato, onion, garlic, potato, brinjal, mushroom and also on livestock and fisheries. There was significant increase in productivity of all the demonstrated crops and livestock under improved practices over conventional practices. The salient findings of the FLDs are given in Table 24.

Table 24. Details of FLDs conducted by KVK Burdwan and North 24 Parganas (Additional) during the year 2024

Crop/Livestock (No of FLDs)	Technology demonstrated	Results
	KVK Burdwan	
Jute (10)	Seed treatment+ Use of seed drill/cycle weeder+ 80:40:40 NPK + retting with CRIJAF SONA	There was 8.86 % increase in productivity of jute in improved practice (35.6 q/ha) over local check (32.7 q/ha).
Paddy (30)	16-18 day old seedling + 10'x10' spacing + chemical weeding + 80:40:40:20 NPKS	There was 12.09 % increase in productivity of paddy in improved practice (59.3 q/ha) over local check (52.9 q/ha).
Potato (20)	Seed treatment with *Trichoderma viridae* and foliar application Cymoxanil + mancozeb (two spray) and Dimethomorph 50% WP (single spray)	There was 16.5 % increase in productivity of potato in improved practice (303 q/ha) over local check (260 q/ha) with a BCR of 2.45.
Cauliflower (16)	Sulphur & boron application	There was 21% increase in productivity due to application of sulphur and boron with an average yield of 224 q/ha. BCR of demonstrated technology was 2.37 over check of 1.90.
Brinjal (20)	Integrated pest management on *Leucinodes orbonalis* using pheromone traps and neem oil.	There was an increment of 20.8% change in yield was obtained with IPM (286.5q/ha) as compared to farmers practice (237q/ha).
Oyster Mushroom (20)	Treatment of machine cut paddy straw with carbendazim 50% W.P, calcium carbonate and formaldehyde.	There was 31.5 % increase in productivity of oyster mushroom in improved practice (96 Kg/100 mushroom beds) over local check (73 Kg/100 mushroom beds)
	North 24 Parganas (Additional)	
Jute (30)		CRIJAF Sona (Powder) : Retting Time (Days)=12.8, Fibre strength (g/tex) =23.00, Root content=6.30 % CRIJAF Sona (Liquid): Retting Time (Days)=11.20, Fibre strength (g/tex) =25.8, Root content=2.7 % Control: Retting Time (Days)=17.60, Fibre strength (g/tex) =19.78, Root content=10.70 %
Jute (30)	Variety-JRO 204	Variety JRO 204: Fibre yield=34.30 q/ha, BC ratio=1.42 Check: Fibre yield=25.9q/ha, BC ratio=1.16
Rice (25)	Variety- CR Dhan 800	Plant height : 95.25 cm; No. of panicles per square meter : 293.3; Yield = 50.25q/ha
Mustard Var.(30)	Variety: PM	Ongoing

Lentil Var.(20)	Variety: Pusa Ageti	Ongoing
Mushroom (50 bags)	Oyster mushroom	Days to pin head formation: 14.5 days, Days to first harvest: 25 days, Yield/bag: 1.50 kg, B:C ratio: 3.27
Broccoli(8)	Green magic	Ongoing
Coloured cauliflower(10)	Carotena	Ongoing
Chinese cabbage(6)	GD 88	Ongoing
Cabbage(10)	Management of Diamond Back Moth by Foliar spray with Neem Seed Powder Pellet formulation (NSPPF)	Ongoing
Jute(10)	Integrated management of Fruit flies in Cucurbits	Ongoing
Fisheries(10)	Popularization of Jayanti Rohu	Ongoing
Goat(20)	Popularization of ecto parasite expeller cum drug applicator	Ongoing

Front line demonstration conducted by KVKs of ICAR-CRIJAF during 2024 in cole crops, jute retting, goatary and poultry

3. Demonstrations Units and Farm Input Production

Three fibre-based IFS Units, viz., Jute Based, Sisal Based and Ramie Based are being maintained at KVK to emphasize the importance of fibre-based IFS in augmenting production and income of farmers. Besides these, KVK is maintaining demonstration units on vermicompost, mushroom, poultry, duckery etc.

Demonstration unit			Farm input production	
Unit	**Variety/Species**	**Quantity produced**	**Product**	**Quantity**
Vermicompost*	*Eisenia fetida*	6,000 worms, 30 qt. vermicompost	Paddy (foundation seed of MTU 7029, CR dhan 800 and grain of Sukumar And Shatabdi	230750 kg
Mushroom	Oyster	35 mushroom beds	Fruit sapling (Mango, Citrus, Guava)	112 pc
Poultry	Kadaknath	20 nos.	Horticulture crops	220 kg
	RIR	30 nos.	Vegetable seedling	7750 pc
	Sonali	26 nos.	Vermicompost	1766 kg
	Haringhata Black	10 nos.	Livestock (Egg, Meat)	60 pc (96.5 kg)
Duckery	Chara Chameli	20 nos.	Fodder	545 kg
Goatary	Black Bengal	05 nos.		
Apiary	*Apis mellifera*	04 bee-hives		

Glimpses of extension activities of KVKs (ICAR-CRIJAF) during 2024

AINP on Jute and Allied Fibres

All India Network Project on Jute and Allied Fibres functions through 8 SAUs and 4 ICAR institute-based centres with it's headquarter at ICAR-CRIJAF, Barrackpore. During the year 2024, a total of 62 (crop improvement 29, crop production 17 and crop protection 16) projects were evaluated on jute (*C. capsularis and C. olitorius*), mesta (*Hibiscus sabdariffa* and *Hibiscus cannabinus*), sunnhemp (*Crotalaria juncea*), ramie (*Boehmeria nivea*), sisal (*Agave sp.*) and flax (*Linnum usitatissimum*) pertaining to crop improvement, crop production and crop protection aspects.

Crop Improvement

A total of 29 projects comprising of 139 trials were evaluated at different centres under crop improvement programme. 14 projects were evaluated for jute, 10 for mesta, and 1 each for flax and ramie, including germplasm evaluation, national hybridization programme, initial evaluation trials, advance varietal trial-I, advance varietal trials-II and adaptive trials on jute and allied fibre crops.

Release and notification of JAF varieties for commercial cultivation

Four varieties of jute and allied fibre crops namely, JRCP 7 of *capsularis* jute, JROP 4 and JROV 5 of *olitorius* jute and JBMP 6 of HC mesta had been released and notified vide the Gazette of India Notification No. S.O. 1560(E), dated 26.03.2024. Besides, one variety each of white jute (JRC 9) and tossa jute (NJ 7068) have also been released and notified vide the Gazette of India Notification No. S.O. 4388(E), dated 08th October 2024. The salient features of these varieties are here as under:

JRCP 7 (Arijit): A white jute variety with average fibre yield 31.50 q/ha and specifically adapted to *capsularis* growing belt of the country under rainfed /irrigated ecosystem of West Bengal, Assam, Bihar, Odisha, Tripura, and Uttar Pradesh. Its potential fibre yield is 39 q/ha and it is tolerant to stem rot and root rot diseases and insect pests like, Bihar hairy caterpillar and stem weevil. Its fibre quality is also better in terms of strength and root content.

JROP 4 (Renuka): The average fibre yield of this variety is 31.24 q/ha and potential fibre yield is 38-39 q/ha. JROP 4 is highly tolerant to stem rot and foot rot diseases and less incidence of insect and pests like, Bihar hairy caterpillar, stem weevil and jute semilooper are observed. It is adapted to entire tossa jute growing belt of the country like, West Bengal, Assam, Bihar, Odisha, and Tripura.

JROV 5 (Vitapat-1): This is first tossa jute variety as leafy vegetable crop which produces 151.31 q/ha average foliage yield in 30 days crop duration. Specifically adapted to olitorius growing belt of the country in rainfed/irrigated ecosystem during March to September. It can also be cultivated as a fibre crop (120 DAS) fetching 35-38 q/ ha fibre yield. It is also rich in leaf vitamin C content (1.05 mg/ g fresh leaf wt) and at par in iron content with other cultivated jute varieties.

JBMP 6 (Titli): A kenaf variety suitable for cultivation in mid to high land rainfed agro-ecological region of West Bengal, Odisha, Maharashtra, Andhra Pradesh, Bihar and NEH regions. The average fibre yield is 28.06 q/ha with potential fibre yield 36-37 q/ha. It has high cellulose and hemicelluloses contents makes it suitable for pulp and paper industries. This variety is tolerant to foot and stem rot disease of mesta and incidence of insect and pests like, aphids, semilooper and mesta mealy bug is very less as compared to cultivated varieties.

JRC 9 (Namita): A coppery red white jute variety suitable for growing in rainfed /irrigated ecosystem of West Bengal, Odisha, Bihar, UP, Tripura and Assam during the March-April to June-July season. It is tolerant to Bihar hairy caterpillar and yellow mite. Its average fibre yield is 32 q/ha with a potential yield of 42-43 q/ha. Fibre quality is also better in terms of less root contents and defects.

NJ 7068: A green stem tossa jute variety developed by Nuziveedu Seeds Ltd. which recorded 32.19 q/ha average fibre yield in coordinated trials with potential yield of about 43 q/ha. It is suitable for cultivation in West Bengal, Assam, Bihar, Maharashtra and Odisha in both rainfed / irrigated ecosystems for mid-march to April sowing.

JAF varieties identified for central release

One variety of HS mesta (AMV-11) has been identified for central release during the 35th Annual Workshop of AINPJAF held at ICAR-CRIJAF, Barrackpore during 22-23 February 2024. The salient feature of this variety is summarised below:

AHS 333: This variety has recorded 29.09 q/ha fibre yield in coordinated trials with a potential fibre yield of 39.68 q/ha. It has better fibre quality in terms of strength, less root contents and defects. It is also tolerant to aphids and white flies and is suitable for cultivation in the mid and highland rainfed agro-ecosystems of Andhra Pradesh, Odisha, Tamil Nadu, Maharashtra and Bihar.

Screening of JAF germplasm for yield, quality, biotic stresses and special traits

Under this project, trials were conducted in following sub-projects at various locations as per the details given below:

NP (JB) 1.12: Evaluation of *capsularis* jute germplasm at Coochbehar, Kalyani, Katihar, Kendrapara, and Nagaon centres.

NP (JB) 1.13: Evaluation of *olitorius* jute germplasm at Coochbehar, Kalyani, Katihar, Kendrapara, Nagaon and Rahuri centres.

NP(MB) 1.12: Evaluation of roselle germplasm at Aduthurai, Amadalavalasa, Katihar and Barrackpore centres.

NP (MB) 1.13: Evaluation of kenaf germplasm at Aduthurai, Amadalavalasa, Barrackpore and Rahuri centres.

Multi-location evaluation of elite lines with improved fibre yield, quality and resistance to diseases and pests

NP (JB) 2.9: NHP with *olitorius* jute-Evaluation of F_7 progenies at Rahuri centre.

NP (JB) 2.10: NHP with *olitorius* jute-Evaluation of F_5 progenies at Coochbehar, Kalyani and Rahuri centres.

NP(JB) 2.11: NHP with *capsularis* jute- Evaluation of F_5 progenies at Coochbehar, Kalyani and Nagaon centres.

NP (JB) 2.12: NHP with *olitorius* jute- Evaluation of F_4 progenies at Coochbehar, Kalyani, Nagaon and Rahuri centres.

NP (JB) 2.13: NHP with *olitorius* jute-Pre-breeding for pest and disease resistance-Evaluation of F_3 cross at Coochbehar, Kalyani, Katihar, Kendrapara, Rahuri and Nagaon centres.

NP (JB) 2.14: NHP with *olitorius* jute-Pre-breeding for fibre fineness-Evaluation of F_3 crosses at Coochbehar, Kalyani, Katihar, Kendrapara, Rahuri and Nagaon centres.

NP (JB) 2.15: NHP with *capsularis* jute-Pre-breeding for fibre strength-Evaluation of F_3 crosses at Coochbehar, Kalyani, Katihar, Kendrapara, Nagaon and centres.

NP(MB) 2.3: NHP with mesta-Station trial of F_7 progenies of kenaf at Barrackpore and Aduthurai centres.

NP (MB) 2.4: NHP with mesta-Evaluation of F_4 progenies of roselle at Barrackpore centre.

NP(MB) 2.5: NHP with mesta-Breeding for YVMV resistance in kenaf-Evaluation of F_3 crosses at Aduthurai, Amadalavalasa and Rahuri centres.

NP(MB) 2.6: NHP with mesta-Pre-breeding for foot and stem rot resistance-Evaluation of F_3 crosses at Amadalavalasa, Aduthurai and Rahuri centres.

NP(MB) 3.1: Mutation breeding in mesta for creation of new variability-Evaluation of M_4 population at Amadalavalasa, Aduthurai, Barrackpore, Katihar and Rahuri centres.

Multi-location evaluation of elite lines with improved fibre yield, quality and resistance to diseases and pests

NP (JB) 5.70: IVT with tossa jute (*C. olitorius*) at Coochbehar, Kalyani, Katihar, Kendrapara, Rahuri and Nagaon centres.

NP (JB) 5.71: AVT-I with tossa jute (*C. olitorius*) at Barrackpore, Coochbehar, Kalyani, Katihar, Kendrapara, Nagaon and Rahuri centres.

NP (JB) 5.72: AVT-II with tossa jute (*C. olitorius*) at Barrackpore, Coochbehar, Kalyani, Katihar, Kendrapara, Nagaon and Rahuri centres.

NP (JB) 5.73: IVT with white jute (*C. capsularis*) at Coochbehar, Kalyani, Katihar, Kendrapara and Nagaon centres.

NP (CB) 1.61: IVT with kenaf (*H. cannabinus*) at Aduthuai, Amadalavalasa, Barrackpore, Coochbehar, Kendrapara and Rahuri centres.

NP (CB) 1.62: AVT-I with kenaf (*H. cannabinus*) at Aduthuai, Amadalavalasa, Barrackpore, Coochbehar, Kendrapara and Rahuri centres.

NP (SB) 12.90: IVT with roselle (*H. sabdariffa)* at Aduthuai, Amadalavalasa, Coochbehar, Katihar, Kendrapara and Rahuri centres.

NP (SB) 12.91: AVT-I with roselle (*H. sabdariffa*) at Aduthuai, Amadalavalasa, Coochbehar, Katihar, Kendrapara and Rahuri centres.

NP (FB) 1.25: AVT-I with flax (*L. usitassimum*) at Barrackpore, Budbud, Coochbehar, Nagaon, Pratapgarh and Sorbhog centres.

NP (RB) 1.13: IVT with ramie (*B. nivea*) at Sorbhog, Coochbehar and Nagaon.

Multi-location evaluation of elite JAF lines for specific traits

NP (JB) 3.9 (Repeat): AVT-I with white jute for late sown conditions at Coochbehar, Kalyani, Katihar, Kendrapara, Nagaoan and Rahuri centres.

Crop Production

Under crop production programme 17 projects comprising of 59 trials were conducted at different centres. Out of 17 projects, seven projects were evaluated for jute, six for mesta, two for sisal and one project each for flax and ramie comprising of fertilizer scheduling, nutrient management, intercropping, cropping systems and yield maximization in jute and allied fibre crops. The trials conducted under various projects are summarized below:

NP(JA) 6.10: Performance of new jute genotypes under Adaptive trials at different fertilizer schedules.

(a) C. olitorius: at Coochbehar, Kalyani, Katihar, Kendrapara and Nagaon centres.

NP(JA) 6.11: Performance of new mesta genotypes under Adaptive trials at different fertilizer schedules.

a) Kenaf (*H. cannabinus*) at Aduthurai, Amadalavalasa, Kendrapara and Rahuri centres.

NP (JA) 6.19 (title modified in 2021): Soil test based fertilizer application in jute/mesta based cropping system for improved nutrient management.

Jute at Katihar, (rainfed) and mesta at Aduthurai, (irrigated) centre.

NP(RA) 2.4: Yield maximization in ramie through improved management practices at Barrackpore, Coochbehar and Sorbhog centres.

NP(SIA) 5.2: Nutrient management in sisal at Amadalavalasa centres.

NP(JA) 7.15(title modified 2018): Carbon dynamics and fertility status of the soils in jute and mesta growing areas.

(a) Jute: Coochbehar, Kalyani, Katihar, Kendrapara & Nagaon centres.

(b) Mesta: Aduthurai, Amadalavalasa & Rahuri centres.

NP(JA) 7.10(title modified 2021): Integrated weed management in jute and allied fibres.

Jute: At Kalyani, Coochbehar, Kendrapara, Katihar, Nagaon centres.

Mesta: At Amadalavalasa, Aduthurai, Rahuri centres.

NP(JA) 7.20: Evaluation of economic performance of jute/mesta-green gram/black gram intercropping systems.

(a) Jute: Barrackpore, Kalyani, Kendrapara, Katihar and Nagaon centres.

(b) Mesta: Amadalavalasa and Aduthurai centres.

NP(MA) 3.5:Comparative evaluation of mesta based cropping systems for higher productivity and profitability at Rahuri centre.

NP(SIA) 5.3 (title modified in 2021): Development of sisal based intercropping system for higher productivity and profitability along with improved resource use at Amadalavalasa centre.

NP(JA) 7.18: Integrated nutrient management in seed production of *tossa* jute (*C. olitorius*) at Rahuri.

NP(JA) 7.19: Conservation agricultural practice under jute-rice-lentil cropping system at Barrackpore, Coochbehar, Kalyani, Katihar and Kendrapara centres.

NP(FLA) 1.5: Development of flax based intercropping system for higher productivity and profitability at Barrackpore, Coochbehar, Kalyani, Katihar and Nagaon centres.

Crop Protection

A total of 16 projects comprising of 62 trials were conducted at different centres. Out of 16 projects, eleven projects were evaluated for jute and five for mesta, comprising of survey and surveillance of pests and diseases, screening of germplasm for pests and diseases, integrated pests and disease management and evaluation of pesticides against pests and diseases of jute and allied fibre crops. The trials conducted under various projects are summarized below:

NP(JMPE)1.1: Survey and surveillance of pests and diseases of jute and mesta at Barrackpore, Coochbehar, Katihar, Kendrapara, Nagaon and Amadalavalasa centres.

NP (JP) 2.8: Intensive screening of tossa jute accessions against stem rot disease at Barrackpore, Coochbehar, Katihar, Kendrapara and Nagaon centres.

NP (JP) 2.9: Intensive screening of white jute accessions against stem rot disease at Barrackpore, Coochbehar, Katihar, Kendrapara and Nagaon.

ST (JE) 2.10: Evaluation of elite C. olitorius jute genotypes against nematode infestation under pot conditions at Coochbehar centre.

NP (JB) 5.71: AVT-I with tossa jute (*C. olitorius*) at Barrackpore, Coochbehar, Katihar, Kendrapara and Nagaon centres.

NP (JB) 5.72: AVT-II with tossa jute (*C. olitorius*) at Barrackpore, Coochbehar, Katihar, Kendrapara and Nagaon centres.

NP (CB) 1.62: AVT-I with kenaf (*H. cannabinus*) at Amadalavalasa, Barrackpore, Coochbehar, Katihar and Kendrapara centres.

NP (SB) 12. 91: AVT-I with roselle (*H. sabdariffa*) at Amadalavalasa, Barrackpore, Coochbehar, Katihar and Kendrapara centres.

NP (JB) 1.12: Screening of white jute germplasm against pests at Coochbehar, Katihar, Kendrapara and Nagaon.

NP (JB) 1.13: Screening of tossa jute germplasm against pests at Coochbehar, Katihar, Kendrapara and Nagaon.

NP (MB) 1.12: Evaluation of roselle germplasms against pests at Amadalavalasa.

NP (MB) 1.13: Evaluation of kenaf germplasms against pests at Barrackpore, Coochbehar, Katihar, Amadalavalasa.

NP (JPE) 2.20: Integrated management of arthropod pests and diseases in jute at Barrackpore, Coochbehar, Katihar, Kendrapara, Nagaon.

NP (JE) 6.9: Management of root-knot nematode (*Meloidogyne* spp) in jute at Coochbehar and Nagaon.

ST (ME): 4.8.: Management of spiral borer in mesta at Amadalavalas.

Research Achievements

Concluded Projects: 2023-24

1. In-house Projects

Project Code: RA 1.2 (2020-2023)

Expansion of ramie-based farming system with improved genotypes and technology

Initiatives were taken for the expansion of the area under ramie plantation to various geographical areas across North-Eastern India, and efforts have been made for creating a standardised social database for the same. Initially, we have identified possible areas for expansion of ramie farming based on agro-climatic and social conditions. In this program, 22 awareness and training of farmers on the ramie-based farming system, demonstration of the best available packages, and technological and physical inputs (>150 q ramie rhizome) to the beneficiary farmers have been provided. Meetings and discussions were held with different stakeholders for ramie area expansion in the respective states. To meet the need for quality planting materials for expansion, a plantation was established. Also, mapping of potential areas for the expansion program has been done. We have also identified possible buyers/industries for marketing linkages for creating better marketing opportunities in the region and utilising the potential of the miracle fibre for uplifting the socio-economic conditions of farmers.

Publications:

1. Das, K., Kar, C. S., Behera, M. S., Sarkar, S., Mitra, S., De, R. K. and Naik, R. K. (2021). Area expansion strategy under ramie farming in north-eastern India with improved genotypes and technologies. Annual Report 2021, ICAR-CRIJAF, pp 68
2. Das, K., Kar, G., Sarkar, S., Behera, M.S. and Naik, R.K. (2022). Strategies for productivity enhancement and area expansion of Ramie (*Boehmeria nivea* L Gaud.) in India, ICAR-Central Research Institute for Jute and Allied Fibres, Barrackpore, Kolkata, PIN-700121. 25p.
3. Das, K., Sarkar, S., Majumdar, B. and De, R. K. (2022). Identification of suitable areas for expansion of ramie farming in North-Eastern India with improved genotypes, technologies & marketing linkages. Annual Report 2022, ICAR-CRIJAF, pp 64
4. Das, K., Kar, C. S., Behera, M. S., Sarkar, S., Mitra, S., De, R. K. and Naik, R. K. (2021). Ramie-based farming system with improved genotypes and technology for area expansion. Jaf News. 19(1).

Project Code: JB 10.1

Genetic improvement of jute genotypes against biotic stresses

- A total of 70 resistant RILs identified from the F_4 generation were evaluated in the F_5 generation in an augmented block design with five blocks and seven checks with 24 error df. Combining F_4 and F_5 generation sick plot screening, 36 RILs were showing stable resistance, which is in almost equal number to 42 F_2 resistant plants, which clearly indicates stem rot resistance is governed by a single recessive gene.
- Based on screening of 85 capsularis germplasm lines for phenotyping, genotyping, and marker trait

association, one marker, MJM_479_2, is associated with BHC resistance. The usefulness of the MJM_479_2 marker in differentiating resistant and susceptible capsularis lines for BHC was confirmed, and further sequencing the amplicon and development of new markers will be useful in marker-assisted breeding in jute.

- Eight interspecific derived lines from different wild genetic backgrounds (WCIN-136-1, WCIJ-150-1, and WCIJ-112) were evaluated for their fibre-yielding capacity. 116 RIL populations of OIJ-248 x WCIN-136-1 were advanced till the F_9 generation.
- Selected lines were screened for nematode (*Meloidogyne incognita*) resistance at two different locations, with WCIN-183A showing resistance and Nalte as susceptible at two locations under artificially inoculated conditions.
- 52 breeding lines (from diverse genetic backgrounds) were screened for premature flowering tolerance and fibre yield. Among these lines, 33 lines recorded pre-mature flowering tolerance, and 22 lines recorded a higher fibre yield than the best check, JRO 8432.
- Few traits specific pre-breeding lines were identified for several useful traits: JROBA-03, a pre-released variety, is resistant to stem rot and has premature flowering tolerance even when sown on 16 February, and RIL-91-2 is also showing premature flowering tolerance when sown on. Same date. RIL 25 and RIL-46 were moderately resistant to stem rot and the Bihar hairy caterpillar.

Germplasm registered with ICAR-NBPGR, New Delhi

- WCIN-136-1 (INGR21036), a wild jute (*Corchorus aestuans*) germplasm registered for being highly resistant to stem rot caused by *Macrophomina phaseolina*.
- OIN-456 (INGR21035), a jute (*Corchorus olitorius*) germplasm, was registered as susceptible to stem rot disease.
- Wild jute germplasm line **WCIJ-150-1** (INGR22146) registered for high stem rot disease resistance.
- Wild jute germplasm line **WCIN-183A** (INGR22147) registered for multiple biotic stress resistance (stem rot, BHC, and root knot nematode resistance).

Variety released

- JROBA 03 variety released and notified [Gazette notification no. S.O.1056(E) dated 6th March 2023]. JROBA-03 is a high-yielding tossa jute entry, developed through inter-specific hybridisation {(Corchorus olitorius L. (OIJ-248) x Corchorus aestuans L. (WB1)}. This variety has a yield potential of 45 q/ha along with premature flowering resistance and stem rot resistance.

Publications

1. Mandal, K., Anil Kumar A., and Ghosh, D. (2021). Development of screening techniques to evaluate response of jute (*Corchorus olitorius*) to *Macrophomina phaseolina*. *Australasian Plant Pathology*, 50:621-630 (NAAS 7.6).

Book chapter:

Kumar, A.A., Sharma, H.K., Maruthi, R.T., Kumari, N., Jha, B.K., Choudhary, S.B. (2022) Jute Interspecific Hybrids: Development, Characterization and Utilization. In: The Jute Genome, pp. 81-88. Springer, Cham

Project code: SLA 1.8

Integrated farming system in sisal plantation under organic management package

Integrated farming systems in jute and sisal were taken up at ICAR-CRIJAF, Barrackpore, and the Sisal Research Station, Bamra, Odisha, respectively. The experiment involved growing field crops in one hectare for sisal and 0.4 ha (one acre) for jute using conventional methods and an integrated farming

system (IFS) mode. The IFS model, consisting of crop components, viz., main crops, intercrops, and crops in cropping sequence, and animal components such as dairy, goatery, poultry, duckery, apiary, pisciculture, mushroom unit, compost unit, vermicomposting, and dike-height horticulture, recorded net returns of ₹1,16,344, which is 84% higher compared to the conventional cropping sequence. Similarly, the Integrated Farming System in Sisal recorded net returns of ₹1,02,645, which is a 125% increase in net return compared to conventional practice. An increase in the milk production of the cattle as well as goat production and efficient resource recycling on the farm through the use of vermicompost and sisal waste led to higher net revenue. "Sisal + goatery + diary + vermicomposting" were the most lucrative sisal-based IFS components under study.

It was also observed that animal products exhibited greater net income among the different enterprises under study than the crops. The IFS System has the potential to increase income generation by increasing employment opportunities by 47% in jute-based IFS and 105% in sisal-based IFS while lowering the risk of crop failure, increasing soil fertility, and, in general, reducing disease and insect pest infestation.

Reports/ Manuals

1. Behera, M.S., Saha, R., Sarkar, S. and Jha, A.K. (2020). Sisal based integrated farming system. *Annual Report 2020*, ICAR-CRIJAF, Barrackpore, pp 28.
2. Behera, M.S., Saha, R. and Sarkar, S. (2022). Integrated farming system in jute and sisal under organic management package. *Annual Report 2022*, ICAR-CRIJAF, Barrackpore, pp 65-66.

Project code: JB 10.4 (2017-2024)

Genetic improvement of jute for diversified end use

Objective: To develop jute genotypes having high biomass, low-branching or higher secondary metabolite accumulation

Output:

Variety	Characteristics/Special Features	Description/ Recommendation
JROB-2 (PURNENDU)	• High green biomass (60 t/ha) at 120 DAS • High fibre yield (32 q/ha) at 120 DAS • High cellulose content of biomass • Strong, fine fibre with less rooty fibre • Resistance to insect pests like yellow mite, stem weevil and hairy caterpillar	The first variety of jute released and notified for biomass production. Useful for diversified application including paper-pulp, bioethanol, biochar and other bio-based products Recommended for all the tossa jute cultivated regions of India
JRCP-5 (PANKAJ)	• High fibre yield (30.25 q/ha) • Potential yield 37 q/ha • Less rooty fibre, high fibre strength • High anthocyanin pigmentation • Tolerance to disease and pests	Capsularis jute growing belt of the country, rainfed /irrigated ecosystem; responsive to high fertilizer. Growing season March/April to June/July.
JRCP-7 (ARIJIT)	• High average fibre yield (31.5 q/ha) • Potential yield 39 q/ha, at par with tossa jute • Less rooty fibre, high fibre strength • Tolerance to stem rot , root rot • Tolerance to hairy caterpillar and stem weevil	All the capsularis jute growing regions of West Bengal, Odisha, Bihar, UP, Tripura and Assam. This variety can replace or supplement the cultivated capsularis variety JRC 698 or the high yielding check variety JRC 517 for comparatively higher yield, disease and insect-pest resistance.

JROP-4 (RENUKA)	• Average fibre yield: 31.2 q/ha • Fibre yield potential: 38 q/ha • High tolerance to insect pests and diseases • Fibre quality at par with popular varieties	Suitable for cultivation in West Bengal, Assam, Bihar and Odisha in both rainfed/irrigated ecosystems.
JROV-5 (VITAPAT-1)	• Biofortified with high leaf vitamin C content (1 mg/ g fresh leaf wt). • Over 150 q/ha foliage yield	The first variety of jute released and notified for vegetable purpose. It has high export potential and can provide nutritional security by supplementing with vitamin C and antioxidants.
JRC-9 (NAMITA)	• Average fibre yield: 32 q/ha • Fibre yield potential: 43 q/ha • High tolerance to insect pests and diseases	High fibre production potential may increase farmers' income by Rs. 8,000-12,000/ha.
JRCNBR-1 (under multi-location trial)	• Genotype with low branching • Production potential at par with other varieties • Suitable for sowing with higher population stand and late sowing condition	May help to extend area of white jute in regions where high branching is observed. Suitable for late sown condition and fine fibre production.

Objective 2: To identify and validate genes contributing to biomass development, low-branching and secondary metabolite biosynthesis in jute

Output:

Trait	Genes identified	Genes validated
Secondary metabolite	• 55 reaction paths involving 40 isoforms of 13 genes involved in flavonoid biosynthesis were identified. • Two downstream pathways responsible for anthocyanin biosynthesis in jute were identified, one via cyanidin formation and the other via pelargonidin synthesis. • The pro-anthocyanidin biosynthesis pathways were also found to be active in young jute stem.	Five genes validades by qRT PCR
Branching/Non-branching	• A homolog of Teosinte Branched 1 (TB1) from Pearl millet was identified from jute. The protein belonged to TCP family transcription factor. • 30 Glutamate amidotransferase genes have been identified from jute.	-
Biomass	• Genes involved in carbon fixation: Ribulose-bisphosphate carboxylase, Fructose-1,6-bisphosphatase I, Fructose-bisphosphate aldolase, • Xylulose-5-phosphate/fructose-6-	Six genes validades by qRT PCR

phosphate, phosphoketolase
- 36 peroxidase genes were annotated as functional genes based on structural prediction and domain analysis.
- 17 genes involved in pectin monomer biosynthesis
- Were identified and characterized.
- Role of rhamnose biosynthesis enzyme (RHM) was established.

Commercialization/technology transfer

- The variety JROB 2 developed under this project has been commercialized for multiplication and marketing of certified seed with non-exclusive license for Rs. 1,18,000/- to Delta Agri-genetics Private Limited, Hyderabad in 2024.
- The varieties JRCP 5, JROP 4, JRCP 7 and JROV 5 have been entered into National Seed Chain.

Production programme

The information generated will benefit future breeding efforts for diversified applications, breeding for climate smart jute and identification of new lines for disease and pest resistance, non-branching phenotype, vegetable purpose jute and breeding for high medicinal value.

ICAR-CRIJAF Technology 2024

(Certified by the Indian Council of Agriculture Research)

Technology Development

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Arvind Kumar Singh
(Lead Developer)

Associate Developers
Ritesh Sahu
M.S. Behera
Suman Roy

of

ICAR-CRIJAF, Barrakpore

has developed the technology

Identification of jute cultivars for their ozone sensitivity/tolerance using ethylene diurea in West Bengal

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Sonali Paul Mazumdar
(Lead Developer)

Associate Developers
Debasmit Dutta, Bijan Majumdar
Nurnabi Meherul Alam, Amit Ranjan Saha
Shergyibu Sarkar, Ritesh Saha
Dilip Kumar Kunda, Sabyasachi Mitra
Gouranga Kar

of

ICAR-CRIJAF, Barrakpore

has developed the technology

Agro-technology for optimization of Sulphur application in jute and mesta cultivation

Protocol Development

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Arvind Kumar Singh
(Lead Developer)

Associate Developers
Sharma A.
Tinkoo Goswami
Gouranga Kar

of

ICAR-CRIJAF, Barrakpore

has developed the technology

Lifecycle assessment of carbon footprint from jute and kenaf made products as alternative to plastics

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

Laxmi Sharma
(Lead Developer)

Associate Developers
Nurnabi Meherul Alam, Suman Roy
Pratik Satya, Gouranga Kar, Subhajit Ghosh
Tinku Goswami, Bijan Majumdar

of

ICAR-CRIJAF, Barrakpore

has developed the technology

Protocol development for production of bioethanol from whole jute biomass for climate change mitigation

Product & Methodology Development

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

N.M. Alam
(Lead Developer)

Associate Developers
Ramesh Babu, Gouranga Kar, Surja Sarkar
S.K. Pandey, K.N. Chourasia, S.P. Mazumdar
S. Mitra, S. Satpathy

of

AINPJAF, ICAR-Central Research Institute for Jute & Allied Fibres, Barrackpore, Kolkata

has developed the technology

Decision support system for extension of disease pest management protocol in Jute and Mesta

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

N.M. Alam
(Lead Developer)

Associate Developers
Gouranga Kar, Surja Sarkar, S. Sarkar, S.K. Jha
D. Barman, S. Mitra, B.S. Gotyal, Suman Roy

of

AINPJAF, ICAR-Central Research Institute for Jute & Allied Fibres, Barrackpore, Kolkata, West Bengal

has developed the technology

CRIJAF Advice (Android-based mobile app) for disseminating farm knowledge to jute and allied farmers

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Certified that

N.M. Alam
(Lead Developer)

Associate Developers
Chayna Jana, Debashis Mandal
Sunita Kumari Meena, Shashi Shekhar Shrimali
Uday Mandal, Sabyasachi Mitra, Gouranga Kar

of

AINPJAF, ICAR-Central Research Institute for Jute & Allied Fibres Barrackpore, Kolkata

has developed the technology

Methodology for identifying best management practices in erosion risk areas of northwestern Himalayas integrating analytic hierarchy process, SWAT model and GIS

Academics & Human Resource Development

IARI-Mega University Hub, Kolkata

ICAR-IARI, New Delhi, has recognized 16 different institutes of ICAR as IARI-Mega University Hubs. ICAR-CRIJAF is one of these hubs entrusted by IARI to initiate UG/PG/PhD teaching in agriculture. In the year of 2024, ICAR-CRIJAF has offered 25 seats for UG, 11 seats for PG (Genetics and Plant Breeding-3, Soil Science-4, Molecular Biology and Biotechnology-2, Agronomy -2) and 5 seats for PhD (Genetics and Plant Breeding-1, Soil Science-2 and Molecular Biology and Biotechnology -2). IARI-Kolkata hub has introduced these programs in association with 8 sister ICAR institutes, namely, ICAR-CIFRI, Barrackpore; ICAR-NINFET, Kolkata; ICAR-NBSSLUP, Kolkata Centre; ICAR-CSSRI, Canning Town Centre; ICAR-NDRI, Kalyani Centre; ICAR-IVRI, Kolkata; ICAR-CIFA, Rahara Centre; and ICAR-CIFE, Kolkata Centre, as hub partners.

Table 25. Academic activities of IARI-Mega University Hub, Kolkata at ICAR-CRIJAF 2024-25

Courses	Disciplines	No. of seats
Undergraduate	Agriculture	25
Postgraduate	Soil Science, Plant Breeding, Agronomy and Molecular Biology and Biotechnology	11
Ph.D.	Soil Science, Plant Breeding and Molecular Biology and Biotechnology	5
Total		41

The institute has created the best facilities for teaching and other co-curricular activities on campus. This hub has the strength of more than 70 faculties of diverse disciplines from across the hub partner institutes. A smart class room with the best audio-visual facilities has been created for all the students of UG, PG, and PhD. Besides, an examination hall, digital library, gymnasium, and other sports facilities are in place to provide the best academic and co-curricular environment that can be held to shape the overall personality of the students. The practical classes are being arranged in the laboratories of different divisions that has been customized for student purposes, which include the Soil Science Lab., Biotechnology Lab., Soil Microbiology Lab., Genetics Lab., Agronomy Lab., Seed Science Lab., PGR Lab., Plant Physiology Lab., Plant Protection Lab., and Farm Engineering Workshop.

The classes for the current academic session started from 15th October 2024. At the beginning of the session, a two-week orientation programme known as '*Deeksharambh*' was organised for Agriculture students, to align with the visionary objectives of the New Education Policy. This comprehensive initiative, spanning from October 15-28, 2024, was meticulously followed the guidelines set forth by the UGC and the Graduate School, ICAR-IARI. It delves

into essential aspects such as discipline, course structure, and extracurricular activities, ensuring students have a clear roadmap for their academic journey. Recognizing the importance of inspiration and guidance, the programme features special talks by esteemed faculties from the Council, ICAR-IARI, and accomplished scientists from the institute. These insightful sessions were designed to motivate and enlighten the young minds, setting the stage for a transformative learning experience that extends beyond the classroom.

A Fresher's welcome program for UG and PG students was organised on 29th November, 2024.

Fresher's Welcome Program of IARI-Mega University Hub, Kolkata held on 29 November, 2024

UG and PG students of 2024 during Fresher's program of IARI-Kolkata Hub (ICAR-CRIJAF)

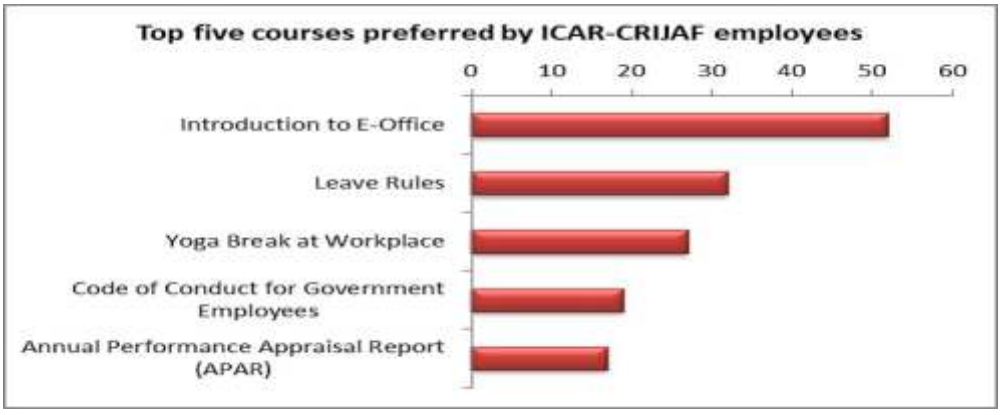
Participation of UG, PG and Ph.D. students during Fresher's Welcome Program of IARI-Mega University Hub, Kolkata

HRD Program for ICAR-CRIJAF

Training and Capacity Building of Staff Members

Since 2024, ICAR-CRIJAF has been inducted in iGOT Karmayogi platform, ensuring anytime, anywhere, any-device learning for civil service officials to enhance their competency. The platform is a robust digital ecosystem enabling continuous anytime-anywhere learning to make the officials future ready. It guides learning, hosts discussions, manages careers, and conducts reliable assessments. Up to December 2024, a total of 148 employees of ICAR-CRIJAF have been on boarded to the iGOT Karmayogi platform. Till 24 December 2024, a total of 208 training completion certificates were awarded to the ICAR-CRIJAF employees. The majority of the employees attended courses on Annual Performance Appraisal Report (APAR), Central Secretariat Functionaries - Role of an Assistant Section Officer (ASO), Code of Conduct for Government Employees, Critical Thinking, Decision Making, Effective Communication, Gender Sensitivity, General Financial Rules, Introduction to E-Office, Introduction to GeM for Buyers, Leave Rules, Noting and Drafting, Prevention of Sexual Harassment of Women at Workplace, Preventive Vigilance, Right to Information (RTI), Stress Management, Time Management and Yoga Break at Workplace.

Apart from iGOT Karmayogi, the institute has conducted the following two trainings for the employees of ICAR-CRIJAF till December, 2024. A total of 37 scientists, 10 KVK personnel and 3 technical personnel have benefited from the trainings.



S. No.	Name of training programme(s) organized	Duration (days)	Category of employees	Participants (No.)
1.	Use of remote sensing software under GIS	3	Scientist	7
			Technical	3
2.	Awareness cum-Capacity Building Programme on NABL Accreditation and Quality Assurance of Soil Testing Labs	1	Scientist	30
			KVK personnel	10

A total of 17 scientific, technical and administrative staffs have attended training on different aspects, such as 'Training on values & Ethics at RKMVCC', 'NABL Assessors' refresher course', 'Pedagogy', 'Remote pilot certificate training', and 'Training of ICAR Nodal Officers of eHRMS-2.0'.

Table 26. Training attended by ICAR-CRIJAF employee during Jan-Dec 2024

Sl. No.	Name of the Staff	Training undertaken
A. Scientific staff		
1	Dr. Kunal Mandal, Principal Scientist	Training on values & ethics at RKMVCC, Rahara on 26.02.2024
2	Dr. S. K. Pandey, Principal Scientist	Training on values & ethics at RKMVCC, Rahara on 26.02.2024
3	Dr. S. K. Jha, Principal Scientist	Training on values & ethics at RKMVCC, Rahara on 26.02.2024
4	Dr. P. Satya, Principal Scientist	One day in person refresher training programme for NABL assessors on 19.1.2024 at New Town, Kolkata
5.	Dr. Rajib De, Principal Scientist	Pedagogy Training at NAAS, New Delhi, 29.01.24-02.02.24
6.	Dr. M. L. Roy, Senior Scientist	Pedagogy Training at NAAS, New Delhi, 29.4.24-03.05.24
7.	Dr. R. K. Nayak, Principal Scientist	Pedagogy Training at NAAS, New Delhi, 29.4.24-03.05.24
8.	Mr. Divte Pandurang, Scientist	Pedagogy Training at NAAS, New Delhi, 01.4.24-05.04.24
9.	Dr. Shamna A., Senior Scientist	Pedagogy Training at NAAS, New Delhi, 01.4.24-05.04.24
10.	Dr. S.P. Majumder, Senior Scientist	Pedagogy Training at NAAS, New Delhi, 01.4.24-05.04.24
11.	Dr. J. K. Meena, Scientist	Pedagogy Training at NAAS, New Delhi, 01.4.24-05.04.24
B. Technical staff		
1.	Sudip Nandy, Technical Assistant	Remote pilot certificate training from 13th January to 15th January 2024 at Amtron Drone School, Guwahati
2.	Kallol Sarkar, Technical Assistant	Remote pilot certificate training from 13th January to 15th January 2024 at Amtron Drone School, Guwahati
C. Administrative staff		
1.	Dilip Kumar Barua, AAO	Regional level Workshop-cum-Training programme for ICAR Nodal Officers eHRMS-2.0 at ICAR-CIFRI, Barrackpore on 19.06.2024
2.	Chandan Kr. Verma, AAO	Regional level Workshop-cum-Training programme for ICAR Nodal Officers eHRMS-2.0 at ICAR-CIFRI, Barrackpore on 19.06.2024
3.	Satarupa Roy Chowdhury, Assistant	Regional level Workshop-cum-Training programme for ICAR Nodal Officers eHRMS-2.0 at ICAR-CIFRI, Barrackpore on 19.06.2024
4.	Ravi Patra, Assistant	Pre-examination training for LDCE for UDC virtually at ICAR-NIASM, Baramati on 21st August 2024 to 06th September 2024

Exposure visit of Trainees and Students from other Institutes/Universities

ICAR-CRIJAF also coordinated the exposure visits of various trainees and students to ICAR-CRIJAF campus during 2024. A total of 344 students visited the institute. The students became acquainted with the CRIJAF technologies through live demonstrations in the field and laboratories. They visited the museum, Agricultural Engineering section, free-flowing retting system, integrated farming system, gene bank, skill development centre, laboratories, etc. The students interacted with the scientists on various scientific advancements on jute and allied fibres.

Table 27. List of colleges and institutes and number of students visited the ICAR-CRIJAF during 2024

Sl. No.	Name	Date	No. of participants
1	All India Tour for B.Sc (Hons.) Agriculture students of Palli Shiksha Bhavana, Visva Bharati	19 March, 2024	56
2	Educational visit of PG (IV Semester) students, Department of Botany, Serampore College, Hooghly	9 May, 2024	15
3	Exposure visit of UG (IV Semester) students, Department of Botany, Scottish Church College, Kolkata	24 June, 2024	19
4	Educational visit of UG (IV Semester) students, Department of Botany, Vidyasagar College for Women, Kolkata	8 July, 2024	15
5	Educational visit of UG (IV Semester) students, Department of Botany, Serampore College, Hooghly	9 July, 2024	18
6	All India Tour for B.Sc (Hons.) Agriculture students of College of Agriculture, Central Agril. University, Imphal	15 July, 2024	21
7	Educational visit of UG (IV Semester) students, Department of Botany, Shri Shikshayatan College, Kolkata	16 July, 2024	25
8	Educational trip of Class XII students of Modern English Academy, Barrackpore	02 August, 2024	35
9	Exposure visit of students of Central Public School, Matarangi, Barrackpore	11 November, 2024	10
10	Educational visit of B.Sc. Agriculture (VII Semester) students of the Swami Vivekananda University, Barrackpore, W.B.	14 November, 2024	40
11	Exposure visit of SHG Women/Traditional Weaver under Anandadhara Project of Nadia District, WB	28 November, 2024	15
12	Educational visit of UG (III Semester) students, Department of Botany, Scottish Church College, Kolkata	09 December, 2024	25
13	Educational visit of UG (III Semester) students, Department	09 December, 2024	10
14	Exposure visit of farmers under ATMA, Samstipur, Bihar	26 December, 2024	40
		Total	344

Glimpses of visit of college and school students to ICAR-CRIJAF in 2024

Farmer's
Outreach

Scientists & Farmers Linkages

Agri-Drone Based Precision Spraying Technology Demonstration

Under the Drone Technology Demonstration Project, ICAR-CRIJAF conducted demonstrations of agri-drones in precision spraying technology. The demonstrations were done at Beraberia, Rattanpur and Paschim Simla villages, in North 24 Parganas (W.B.) during 15 March, 2024 and 25 June 2024. This event was attended by more than 200 farmers covering an area of 20 hectares. Farmers were given an in-depth overview of the operational aspects of agri-drones and their benefits.

Awareness-cum-Training program on Efficient Use of Agro-Inputs For Higher Farm Yield

Awareness program on "Efficient use of agro-inputs for higher farm yield" under SCSP, along with a training program on "Improved and scientific methods of cultivation for higher yield," sponsored by Rashtriya Chemicals & Fertilizers Limited, Kolkata, was organised at ICAR-CRIJAF, Barrackpore, on 8 January, 2024. A total of 100 farmers from the villages of Beraberia, Basudevpur, Paschim Suryapur, Chandigarh, and Taranghati in the North 24 Parganas participated in the program. A hands-on training session on efficient use of agro-inputs was organised in the field.

Paddy Seed Distribution Program for SC Farmers of Sundarban, West Bengal

A paddy seed distribution program was organised under SCSP on 20 June, 2024 at Kultali village, South 24 Parganas, in association with the Kultali Milon Tirtha Society for the livelihood and technological improvement of SC women farmers. The objective of this program was to make the small and marginal farmers self-reliant by enhancing their farm income through the adoption of modern farm technologies. Dr. G. Kar, Director, ICAR-CRIJAF, graced the program. The event was attended by more than 500 SC farmers along with representatives from the press and media. In this program, 2.5 tonnes of certified paddy seed (Var. Swarna/MTU 7029) were distributed among the farmers.

Drone technology demonstration by the scientists of ICAR-CRIJAF

Paddy seed distribution by the Director, ICAR-CRIJAF

Kisan Sangosthi

A Kisan Sangosthi was organised at Gobardanga Seba Farmers' Samity, North 24 Parganas, on 5 February 2024. Around 260 farmers, farm women, and FPC members participated in this program. Dr. G. Kar, Director, ICAR-CRIJAF, motivated the participants to adopt improved farming practices in jute-based cropping systems. He appraised the on-going extension activities of the institute in this area.

Farm Mechanization for Enhancing Productivity and Profit

A five-day training program on "Farm mechanisation in jute-based cropping systems for enhancing productivity and profit" was organised at ICAR-CRIJAF, Barrackpore, during 2-8 January, 2024, under SCSP. Fifteen SC farmers from Beraberia and Ratanpur villages in Amdanga Block, North 24 Parganas, attended the program. The training dealt with the importance of farm mechanisation in jute-based farming systems and operation of oil engines, use of tractor and power tiller in agriculture, improved production technology of jute, safe use of plant protection equipment, role of custom hiring centres in farm mechanisation and maintenance of safety in the workplace.

Skill Development for Making of Jute Fibre Based Handicrafts

A ten-day training programme on "Making of jute fibre-based handicrafts" was organised at ICAR-CRIJAF-facilitated Jute Diversified Product Training-Production Hub, Gobardanga, North 24 Parganas, during 4–13 March and 15–24March, 2024, under the SCSP program. A total of 30 SC women from Gobardanga and its nearby areas participated in this training program. The training was mainly focused on developing the primary skills in making flower vases, scenery with birds, Maa Durga memento, Lord Ganesha memento, folders, and bags by using jute fibre.

Skill Development for Designing and Making of Customized Jute Bags

ICAR-CRIJAF organised skill development training on "Designing and making of customised jute bags" from April 22 April to 07 May, 2024 under the SCSP Program. Twenty farm women from Barrackpore 1 block, North 24 Parganas, had participated in the training program. The trainees were imparted skills in customised jute bag making. The trainees were very satisfied with the training content and had actively participated in the sessions. An exhibition of all the products made by the trainees was arranged at the valedictory function.

SC women participating in Skill Development training on designing and making of customized jute bags

Certificate distribution during valedictory of Training program

Organic and Natural Farming Inputs Production for Sustainable Agriculture

A five-day skill development training program was organised on "Preparation of organic and natural farming inputs for sustainable agriculture" for farmers and rural youth during 22-26th July, 2024. The topics covered include methods of bio-stimulants preparation natural farming, methods of composting, insect-pest management, neem-based pesticides, biocontrol agents and their mass multiplication for plant disease management, fish-based IFS, and the importance of livestock manure. Altogether, 30 farmers from the Beraberia, Bodai, Singerber, and Basudevpur villages of West Bengal participated.

Improved Retting Technology for Quality Jute Fibre Production

A training-cum-field demonstration program on 'Improved retting technology for quality jute fibre production' was organised during 3-12 August, 2024, for the SC farmers of Hingalganj block (5 Aug 24), Gaighata block (6 Aug 24), Ranaghat block (7 Aug 24), Swarupnagar block (10 Aug 24), and Habra-I block (12 Aug 24) of North 24 Parganas and in Chakdah block (5 Aug 24) of Nadia district. During the programme, the farmers learnt about the different aspects of improved retting technologies of jute, particularly the importance of improved retting of jute by CRIJAF SONA, its detailed procedure, the disadvantages of traditional retting practices using mud and banana stem, and essential requirements for fetching a good price from the sale of fibre. Field demonstrations were conducted in 8 villages. A total of 300 farmers participated in the program.

Jute Fibre Quality Evaluation and Grading Systems

A training on "Jute fibre quality evaluation and grading systems" was organised for SC farmers of Swarupnanagar and Habra-I block, North 24 Parganas district, during 18-20 September, 2024. During the program, the farmers learnt about the different aspects of jute fibre quality and grading systems, particularly the importance of fibre quality and grading systems of jute, jute fibre grading systems and their application, various instruments used for jute fibre grading, and marketing aspects of quality jute fibre. A total of 75 farmers from the Bara Bankra, Choto Bankra, and Goaldaha villages of the Swarupnagar block and from the Bharati Nagar, Kumra Kashipur, and Nikarati villages of the Habra-I block, North 24 Parganas, participated in this training program.

Participating farmers of training on 'Farm Mechanisation' and 'Jute fibre quality evaluation' at ICAR-CRIJAF, Barrackpore

Basic Skill Development for Making of Jute Bags and Handicrafts by Rural Women of Sundarban

A ten-day basic skill development training program on making jute bags and handicrafts was organised by ICAR-CRIJAF, Barrackpore, for rural women of Sundarban during September 20-29, 2024, at ICAR-CRIJAF, Barrackpore. A total of 20 SC women nominated by the Kultali Milon Tirtha Society from different villages of the Basanti Block of the Sundarban region participated in this training program. During the training, the basic skill of the participants was developed in making jute ornaments, flower bouquets, rakhi, Lakshmi jhapi, Chand Mala, file bags, Shantiniketani bags, shopping bags, sling bags, purses, ladies bags, and key rings. During the valedictory session, the director of the institute interacted with participants to create sustainable livelihood options through skill development in making value-added, jute-diversified products.

Use of Farm Machinery in Agriculture and Role of Custom Hiring Centres

A three-day training on "Use of farm machinery in agriculture and role of custom hiring centres in farm mechanisation" was organised at ICAR-CRIJAF, Barrackpore, during 22-24 October, 2024. Trainees visited Kojagori Farmers Producer Company Limited at Babpur, Amdanga Block, North 24 Parganas, to get first-hand knowledge about its formation, management, and different activities carried out for its sustainability. In the valedictory session, Dr. Gouranga Kar, Director, ICAR-CRIJAF, Barrackpore, motivated the trainees about the crop diversification and emphasised the use of improved farm machinery for better input utilisation, reduction in cost of cultivation, value addition, and creating a business model in agriculture. A total of 20 trainees from two villages (Goaldah and Kumra, North 24 Parganas) participated in the training program.

Basic Skill Development on Making of Jute Showpiece

A ten-day basic skill development training program on making jute showpieces was organised for rural women of the Amdanga block, North 24 Parganas, during October 21-30, 2024. During the training, the basic skill of the participants was developed in making different decorative items made of jute, like flower vases, bird sceneries, and faces of Lord Ganesha and Maa Durga. The trainees were also motivated to continue their practice in making these items after the training so that they can fine-tune their acquired skill. A total of 20 SC women participated in this training program. Most of them are the members of different SHGs.

Participating ST farm women preparing diversified jute products under DST-SEED Project training

Training on Role of Custom Hiring Centres in Farm Mechanisation

TRAINING PROGRAMME ORGANISED (Jute-ICARE, ATMA, DST-SEED, KVK, etc.)

Sl. No.	Subject of Training	Place of training	Duration (Date)	No. of Participants
1.	Jute production technology (ATMA, Pakur, Jharkhand)	ICAR-CRIJAF, Barrackpore, W.B.	5-9 February, 2024	25
2.	Ramie fibre production and distribution of agri-inputs	RRS, Sorbhog, Assam	4 & 6 March, 2024	200
3.	Improved production technology for quality Jute fibre production (Jute-ICARE)	ICAR-CRIJAF, Barrackpore	14-15 March, 2024	20
4.	Improved production technology for quality Jute fibre production (Jute-ICARE)	ICAR-CRIJAF, Barrackpore	18-19 March, 2024	20
5.	Improved production technology for quality Jute fibre production (Jute-ICARE)	ICAR-CRIJAF, Barrackpore	21-22 March, 2024	20
6.	Crop management and plant protection techniques in organic farming	Baduria, N24 Prg, W.B.	26 July, 2024	25
7.	Improved microbial jute retting by CRIJAF Sona	Jangal Para, Kharupetia, Assam	1August, 2024	52
8.	Agro-mdvisory services for improved farming of jute and allied fibres	ICAR-CRIJAF, Barrackpore, W.B.	12-14 November, 2024	20
9.	Handling bulk production of jute bags (DST-SEED)	ICAR-CRIJAF, Barrackpore, W.B.	20 – 26 March, 2024	25
10.	Line sowing in jute using jute seeder (DST-SEED)	Basudebpur, Barrackpore, W.B.	9 April, 2024	25
11.	Entrepreneurship development in value addition of jute fibre and fabrics (DST-SEED)	ICAR-CRIJAF, Barrackpore, W.B.	10 – 25 June, 2024	20
12.	Awareness program on group formation, group cohesion and group dynamics for members of SHGs (DST-SEED)	Beraberia & Ratanpur, N24 Prg, W.B.	January to November, 2024	180
13.	Value chain management in jute and focused group discussion	Amdanga, Ratanpur, Beraberia, Basudebpur, N24 Prg, W.B.	23-26 December, 2024	90
			Total	722

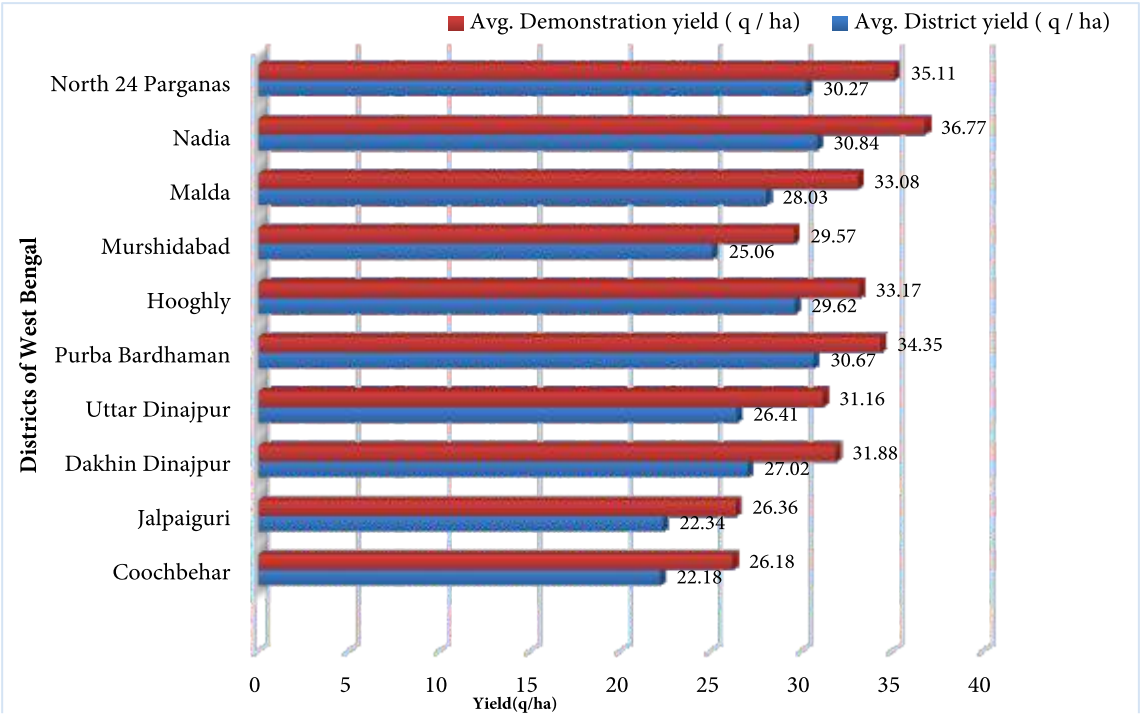
Training programmes conducted by Krishi Vigyan Kendra (KVK)

Training Category	Number of Trainings	No. of Participants						Grand Total
		General			SC/ST			
		Male	Female	Total	Male	Female	Total	
KVK, North 24 Parganas								
Practicing Farmers	33	112	120	232	237	258	495	**727**
Rural Youth	13	20	50	70	100	120	220	290
Extension Functionaries	3	10	12	22	12	16	28	50
Total	**49**	**142**	**182**	**324**	**349**	**394**	**743**	**1067**
KVK, Burdwan								
Practicing Farmers	17	0	0	0	359	151	510	510
Rural Youth	5	0	0	0	57	80	137	137
Extension Functionaries	1	6	12	18	1	16	17	35
Total	**23**	**6**	**12**	**18**	**417**	**247**	**682**	**682**

National Food Security Mission

Frontline demonstrations (FLD)

Improved production technologies of jute under NFSM (CC) jute: Frontline demonstrations on the latest high yielding jute varieties (JRO 204, JBO 2003-H, JROG 1, JROMU 1& CO 58) and other improved production technologies (weed management through the CRIJAF Nail Weeder / CRIJAF Single Wheel Jute Weeder, line sowing by CRIJAF Multi row Seed Drill / CRIJAF Jute Seeder / improved retting through CRIJAF SONA) of jute were conducted through Krishi Vigyan Kendras (KVKs) situated in major jute growing districts viz. North 24 Parganas, Hooghly, Murshidabad, Purba Bardhaman, Uttar Dinajpur, Dakhin Dinajpur, Coochbehar, Jalpaiguri, Malda and Nadia of West Bengal.



Farm implements distribution to farmers for FLD under NFSM

Around 13q of jute seeds of different varieties, CRIJAF Jute Seeder (19 Nos.), CRIJAF Nail Weeder (37 Nos.), CRIJAF Single Wheel Jute Weeder (33Nos.) were provided to the farmers through the KVKs in their respective districts and farmers were made aware of the importance of certified seeds and other improved jute production technologies and importance of certified seeds and improved jute variety. Accordingly, FLD on improved varieties were conducted in various village clusters of different districts of West Bengal. Frontline demonstrations on the latest high yielding varieties (JRO 204, JBO 2003-H, JROG 1, JROMU 1 & CO 58) significantly enhanced the average yield by 12 – 18 % over the district averages.

FLD on jute sowing in line using CRIJAF-Multi-row Seed drill

FLD on jute retting using CRIJAF Sona

SCSP, TSP and NEH Programs

Scheduled Caste Sub-Plan (SCSP), Tribal Sub-Plan (TSP) and NEH programs were taken up by ICAR CRIJAF to address the issues and problems related to farming faced by scheduled caste and tribal communities in an integrated way. These programmes focused primarily on promotion of R&D based proven technologies for skill and livelihood improvement to facilitate SC and ST farmers in their developmental aspiration backed up by the supply of adequate resource and technological knowhow.

Scheduled Caste Sub-Plan (SCSP)

ICAR-CRJAF implemented Scheduled caste sub-plan activities in various villages of North 24 Parganas, South 24 Parganas, Nadia, Bankura, Purulia and Purba Bardhaman districts. In order to develop knowledge and skill of SC farmers by identifying and addressing the issues related to low farm income in the field of agriculture and allied field, various capacity building activities like trainings and demonstration in several districts of West Bengal were conducted. During 2024, altogether 11 training programmes, 10 Field demonstration/ awareness programmes on improved method of jute production/ jute retting and 2 mega events on paddy seed distribution and tree plantation were conducted and about 2555 SC farmers were benefitted from the program.

Successful technology models, farm equipment, improved seed, animal components and other agricultural inputs for improving the farm income in jute and allied fibre based cropping programme were promoted among the SC farmers with adequate resource support. Various agricultural inputs like improved variety of jute, paddy, and vegetable seeds, fertilizers, vermicompost beds, CRIJAF Sona, crop protection kits and farm implements/tools (CRIJAF single wheel jute weeder, jute seeder and Battery operated Sprayers), were distributed to more than 16000 farmers.

Table 28. Capacity building programmes under SCSP

Capacity building programme	Date/Place	No. of Participants
1. Farm mechanization in jute-based cropping systems for enhancing productivity and profit	2-8 January, 2024 ICAR-CRIJAF, Barrackpore	15
2. Efficient use of agro-inputs for higher farm yield	8 January, 2024 ICAR-CRIJAF, Barrackpore	100
3. Skill development training on making of jute fibre-based handicrafts	4-13 March, 2024 Gobardanga, North 24 Pgs	15
4. Skill development training on making of jute folders and bags	15-24 March, 2024 Gobardanga, North 24 Pgs	15
5. Designing and making of customized jute bags	22 April- 07 May, 2024 ICAR-CRIJAF, Barrackpore	20
6. Designing and making of customized jute bags	30 July 09 August, 2024 ICAR-CRIJAF, Barrackpore	30
7. Improved retting technology for quality jute fibre production	3 August, 2024 Hingalganj, North 24 Pgs	50
8. Improved retting technology for quality jute fibre production	5 August, 2024 Chakdah, Nadia	50

9.	Improved retting technology for quality jute fibre production	6 August, 2024 Swarupnagar, North 24 Pgs	50
10.	Improved retting technology for quality jute fibre production	07 August, 2024 Ranaghat, Nadia	50
11.	Improved retting technology for quality jute fibre production	10 August, 2024 Gaighata, North 24 Pgs	50
12.	Improved retting technology for quality jute fibre production	12 August, 2024 Habra, North 24 Pgs	50
13.	Designing and making of customized jute bags	12-30 August, 2024 ICAR-CRIJAF, Barrackpore	25
14.	Jute fibre quality evaluation and grading	18-20 September, 2024 ICAR-CRIJAF, Barrackpore	75
15.	Making of jute bags and handicrafts for rural women of Sundarban	20-29 September, 2024 ICAR-CRIJAF, Barrackpore	20
16.	Making of jute show piece	21-30 October, 2024 ICAR-CRIJAF, Barrackpore	20
17.	Use of farm machinery in agriculture and role of custom hiring centres in farm mechanization	22-24 October, 2024 ICAR-CRIJAF, Barrackpore	21
18.	Agri-based fish farming system	8 November, 2024 Hingalganj, North 24 Pgs	50
19.	Fundamental aspects of fish farming and the significance of feed management in aquaculture	19 November, 2024 Hingalganj, North 24 Pgs	120
20.	Imrpoved fish farming	22 November, 2024 Gaighata, North 24 Pgs	29

Training and FLD activities under SCSP sub-Plan 2024

Tribal Sub Plan (TSP)

A series of activities were undertaken under Institute STC-TSP programme for overall development of schedule tribe (ST) farming communities in identified villages of Nadia and North 24 Parganas district of West Bengal during the year 2024 through integrated approaches in jute and allied fibres based cropping systems with various components like nutritional garden, field crop cultivations, vegetables and fruit plantations, fisheries, backyard poultry, vermicomposting, etc. with adequate resource support, successful technology models, farm implements, improved seeds, animal components, fish and poultry feed along with other appliances for improving household food security, farm income and additional employment opportunities under jute and allied fibre based cropping system.

Table 29. Inputs distribution under TSP program

Inputs	Quantity
Seeds (jute, rice, mustard, lentil etc.)	15.1 ton
Essential major nutrients	125 kg
FYM	400 kg.
Small equipment's (up to Rs 2000)	150 nos.
CRIJAF SONA -Microbial formulation for retting	1.6 ton

To promote a jute-based farming system, various enterprises, such as vegetable cultivation, fishery, vermicomposting, organic farming etc., along with technological support, were provided to approximately 1720 ST farmers in West Bengal. Farm inputs (seeds, fertilizers, CRIJAF SONA, fish feed) and farm tools (sprayer, jute seeder, jute weeder, etc.) were given to all participating farmers.

Training and FLD activities under TSP 2024

Scientists of ICAR-CRIAF has conducted various capacity building programme like awareness camp, animal health camp, world soil day, trainings and demonstrations in several districts of West Bengal. During 2024, thirty one (31 nos.) training program were conducted which benefitted about 620 ST farmers.

Table 30. Capacity building program under STC-TSP Program

S. No.	Starting Date	Ending Date	Capacity building Programme	No. of Participants
1.	10/01/24	12/01/24	Farm mechanization in jute	20
2.	17/01/24	19/01/24	Integrated pest management for enhancing productivity in jute based cropping system	20
3.	29/01/24	31/01/24	Crop residue management in jute-based cropping	20
4.	05/02/24	14/02/24	Designing and making of customized jute bags	20
5.	27/02/24	29.02.2024	Improved agro-technology and disease-pest management in jute-based cropping systems	20
6.	05/03/24	05/03/24	Pond-based integrated self-reliant eco-farming systems	20
7.	11/03/24	13/03/24	Women-friendly farm implements for drudgery reduction in agriculture	20
8.	08/04/24	10/04/24	Agro-technology for improved jute production	20
9.	24/04/24	26/04/24	Mechanized jute cultivation	20
10.	19/05/24	19/05/24	Improved retting in jute	20
11.	24/05/24	26/05/24	Improved retting technology with CRIJAF Sona in jute	20
12.	29/05/24	31/05/24	Management of biotic stresses in jute	20
13.	05/06/24	05/06/24	World Environment Day	20
14.	09/06/24	11/06/24	Post-harvest management and processing of jute	20
15.	21/06/24	23/06/24	Improved retting technology with CRIJAF Sona in jute	20
16.	05/07/24	07/07/24	Pond based integrated farming systems	20
17.	10/07/24	19/07/24	Making of jute fibre-based decorative articles	20
18.	26/07/24	28/07/24	Multiple use of *In-situ* tank water for enhancing water productivity in agriculture	20
19.	07/08/24	09/08/24	Organic farming and zero budget natural farming in jute based cropping system	20
20.	21/08/24	23/08/24	Backyard poultry production for additional income of the jute growing tribal farmers	20
21.	04/09/24	06/09/24	Nursery raising techniques in vegetables	20
22.	11/09/24	20/09/24	Making of office files and folders using jute fabric	20
23.	25/09/24	27/09/24	Bio-composting techniques for safer environment	20
24.	04/10/24	06/10/24	Improved agro-technology in jute based cropping systems	20
25.	11/10/24	13/10/24	Scope of duck farming in enhancing rural live hood in jute growing areas	20
26.	06/11/24	08/11/24	Use of Artificial Intelligence (AI) in agriculture	20
27.	15/11/24	17/11/24	Mushroom production technology	20
28.	20/11/24	29/11/24	Training on making of different jute handicrafts	20
29.	06/12/24	08/12/24	Improved seed production technology of major crops cultivated in West Bengal	20
30.	13/12/24	15/12/24	Profitable goat farming	20
31.	20/12/24	22/12/24	Pond based integrated farming systems	20
			Total	**620**

North Eastern Hill (NEH) Program

ICAR-CRIJAF has undertaken different activities under NER/ NEH component of the budget during 2024.

Awareness programme & agri-input distribution: Farmers' awareness programme cum distribution of agri-inputs (vermibed and related items) for 200 farmers were organized during 4-6 March, 2024 at Ramie Research Station, Sorbhog, Assam. During 4-6 September, 2024 three farmers' awareness programme and input distribution on jute-based farming system were organized at Sorbhog and at Barpeta, Assam for 300 farmers. In the programmes 300 units of jute seeder and single wheel jute weeder were also distributed among the beneficiary farmers.

Distribution of ducklings, duck feed and mineral mixture: During 15-18 September, 2024 farmers awareness programme and distribution of ducklings, duck feed and mineral mixture were organized at KVK, Tura, Meghalaya and at Bapujinagar, Goalpara, Assam. In the awareness programme, 2000 broiler ducks (white pekin), 2000 layer ducks (khaki Campbell), 5000 kg of poultry feed, and 100 kg of mineral mixture were also distributed among the 200 beneficiary farmers of Meghalaya and Assam. The beneficiary farmers expressed that they are immensely benefitted from such activities for their economic development and building self-confidence.

Training on orchid and planting material distribution: Two one day orchid training- cum-planting material distribution programmes were conducted at Pakyong, Sikkim (on 5 October, 2024) and at Agartala, Tripura (27 November, 2024) which was organized by ICAR-National Research Centre for Orchids under the NER/ NEH budget of ICAR-CRIJAF. In the programmes Dendrobium, Phalaenopsis, Cymbidium, Vandaceous, Aranda/Mokara orchids, organic nutrient solutions, and orchid mix was distributed to the beneficiary farmers of Sikkim and Tripura.

Training and FLD activities under NEH/NER Scheme

Awareness programme and input distribution on use of farming tools: Three awareness programme and input distribution on use of farming tools were organized at Nalbari (13 December 2024), Barpeta (14 December 2024) and Ramie Research Station, Sorbhog (16 December 2024). In the programme, 300 farmers participated and inputs like 100 sprayers, 100 CRIJAF weeder and 300 CRIJAF jute seeder were distributed.

Vermibed and vermi (*Eisenia fetida*) distribution: Vermibed (300 nos.) and 300 kg of vermin earthworm (*Eisenia fetida*) were distributed among 300 farmers identified by ICAR-KVK, West Garo Hills, Meghalaya. The farmers of Meghalaya were given training on method of producing vermicompost by the concerned KVK.

Distribution of agri-tools: During 28-30 October 2024, three awareness programme and agri-input distribution were conducted at Ramie Research Station, Sorbhog (2 nos.) and Barpeta, Assam. In these programmes, 300 farmers were given knapsack sprayer, spade, sickle, khurpi, gardening and watering kits. The farmers after receiving the agri-tools expressed that all those tools will be very useful for their day-to-day farming activities.

Hybrid maize seed distribution: In total 1000 kg of hybrid maize seed (cv. NMH 920) were distributed among the 100 maize growers of Meghalaya and a training was conducted on improved production technology of maize.

Mera Gaon Mera Gaurav

An initiative has been taken by ICAR-CRIJAF to promote the direct interface of scientists with farmers under the *Mera Gaon Mera Gaurav* (MGMG) program to increase the process of lab-to-land technology dissemination. During 2024, a total of 43 villages could be covered under the MGMG program for providing the benefit of institutes' technologies, agro-advisories, outreach extension programs (SCSP, TSP, NFSM), and CSS to these villages. The major work undertaken under the MGMG program was the distribution of agricultural inputs like seed, fertilizer, chemicals, agricultural machinery, etc. Awareness programs were conducted to make them aware of the programs on sensitive issues of national importance, such as Swachh Bharat Abhiyaan, climate change, water conservation, soil fertility, etc. Technical problems were also addressed at the village level and made use of in prospective research programs to generate technical, social, and economic data related to institute technical programs. The farmers were involved in programs like Swachhta Abhiyan, Kisan Diwas, World Soil Day, World Environment Day, World Food Day, International Women's Day, etc. These activities helped the farming community increase their awareness of different farming issues and related aspects.

Table 31. Groups of scientists and the allotted villages under MGMG program of ICAR-CRIJAF

Group	Group Members	Villages (District)	Group	Group Members	Villages (District)
1.	Dr. S.K. Sarkar Dr. A.K.Singh Dr. J. K. Meena	Ghidah, Selampur, Gustia, Telenipara, Chapuria (North 24 Parganas)	6.	Dr. C.S. Kar Dr. D. Barman Dr. V. Ramesh Babu	Kumra, Kashipur Rudrapur, Bijoynagar, (North 24 Parganas)
2.	Dr. Jiban Mitra Dr. M.L. Roy Dr. D. Datta Ms. Kanti Meena	Belle Sankarpur, Keuti, Tetulia, Bhabagachi,Rautara (North 24 Parganas)	7.	Dr. S. Mitra Dr. Kunal Mondal Dr. D. Saha Dr. Tribhuvan R.	Paschim Simla, Dighirpar, Chandanpur, Durgapur, (North 24 Parganas)
3.	Dr. S. Kumar Dr. C. Biswas Dr. S. Datta	Athghara, Kirtipur, Rajapur, Kanupur, Panji (North 24 Parganas)	8.	Dr. S.K. Jha Dr. S.K. Pandey Dr. N.M. Alam Dr. Sourav Ghosh Ms. Lavanya A.K	Jagannathpur,Neulia,Purba Bishnupur,Goalbari,Chinili (Nadia)
4.	Dr. B. Majumdar Dr.A.K. Chakraborty	Hansia,Basudebpur Kairapur,Mathurapur (North 24 Parganas)	9.	Dr. D. Sarkar Dr. S. Sarkar Dr. P. Satya Dr. Ritesh Saha	Makaltala, Farmania, Sonakenia, Beliakhali, (North 24 Parganas)
5.	Dr. S. Satpathy Dr. R.K. De Dr. Amit Bera Dr. S.P Mazumder	Panji, Baduria, Bankra, Pingaleswar, Koijhury (North 24 Parganas)	10.	Dr. R.K. Naik Dr. Shamna.A Dr. K.N. Chourasia	Beraberia,Chharuhat, Bijoypur, Ratanpur, Dakhin Hansia (North 24 Parganas)

Swachh Bharat Mission

ICAR-CRIJAF, Barrackpore celebrated *Swachh Bharat Diwas* on 2nd October 2024, organizing a wide array of engaging activities and programs in compliance with directives from the ICAR, and the Ministry of Environment, Forest and Climate Change. The institute prominently displayed banners with the theme "*Swabhav Swachhata-Sanskar Swachhata*" and held a solemn pledge-taking ceremony to reinforce the commitment to cleanliness. The "*Ek Ped Ma Ke Naam*" tree plantation drive added a touch of green to the campus, with staff members actively participating to create a pollution-free environment. Creativity and awareness were fostered through a slogan writing competition for staff, as well as drawing and quiz contests at nearby schools. ICAR-CRIJAF also conducted enlightening *Swachhata Samvad* programs for farmers, students and rural people for spreading the message of cleanliness at local schools and villages. Recognizing the invaluable contributions of *Safai Mitras* (sanitation workers), ICAR-CRIJAF's Swachhta Committee felicitated them. A preventive health check-up camp was also arranged for the *Safai Mitras*, ensuring their well-being. Through these multifaceted initiatives, ICAR-CRIJAF, Barrackpore celebrated Swachh Bharat Diwas with great fervour, spreading awareness and inspiring action towards a cleaner and greener India.

Swachhta Hi Seva activities was also organised from December 2-15, 2024. Eye-catching banners were printed and prominently displayed to spread awareness. A solemn pledge taking ceremony reinforced the institute's commitment to cleanliness. Impactful awareness programs were conducted in nearby villages, educating farmers and farm women on optimal management of farm and household waste. Villagers learned improved vegetable cultivation methods to boost their incomes. The institute also took the opportunity to review and weed out old records, properly disposing of scrap items. Cleanliness drives were carried out across the institute campus, a local school, villages, and parks. An engaging quiz competition tested the knowledge of local school students. Through these multifaceted initiatives, ICAR-CRIJAF made meaningful strides in promoting the *Swachhta Hi Seva* mission.

Various activities of swachh Bharat Mission programme conducted by ICAR-CRIJAF

Women Empowerment

Women play an important role in agriculture, and empowering them technologically and economically would have a huge impact on overall economic development. The ICAR Central Research Institute for Jute and Allied Fibres had initiated research and an extension convergence approach with the farm women to come up with women-friendly technologies and off-farm income-generating activities suitable to enhance their income and, in turn, empower them. Women's empowerment in agriculture includes empowerment in terms of agricultural production decisions, access to and decision-making power over productive resources, control over the use of income, leadership roles within the community, and time allocation.

Women friendly farm implements to reduce drudgery

Recognizing the challenges faced by women farmers, ICAR-CRIJAF implemented a program to introduce women-friendly farm implements, aiming to reduce drudgery and improve their working conditions. The key focus was on mechanizing tasks like sowing and weeding, traditionally performed manually by women, often under harsh conditions. The CRIJAF Multi-Row Seed Drill (MRSD) was modified to make it lighter and more suitable for women farmers. The lighter weight, combined with the transparent and weather-resistant seed box, significantly reduced the physical exertion required for sowing jute. This innovation was welcomed by the women farmers, who reported a considerable reduction in drudgery during the sowing operation.

Features of modified MRSD

- Lighter weight
- Transparent & weather-resistant seed box
- Improved ergonomics

Benefits for women farmers

- Reduced drudgery
- Improved efficiency and speed of sowing
- Enhanced work comfort

The introduction of the Single Wheel Jute Weeder was another significant step towards drudgery reduction. Manual weeding in jute is a laborious task, often performed during extreme heat and humidity. The Single Wheel Jute Weeder, along with the Nail Weeder, allowed for mechanical weeding, reducing the amount of manual labour and physical strain. Demonstration-cum-training programs were organized in various villages, educating women farmers on the proper use of these tools. Farm women reported a significant reduction in the time and effort required for weeding. The low cost and ease of handling of these implements made them readily accessible and popular among women farmers.

Participation of women farmers in jute sowing using MRSD

Economic empowerment of farm women

ICAR-CRIJAF implemented programs to enhance the skills and entrepreneurial capabilities of farm women. These programs aimed to diversify their income sources and provide them with opportunities for self-reliance and economic independence. The institute organized skill development training programs on jute bag making, jute ornament production, and the integration of poultry and duckery into jute-based farming systems. These trainings were designed to empower women farmers with marketable skills, enabling them to participate in value-added activities and generate income.

Entrepreneurship through Self Help Groups

ICAR-CRIJAF encouraged the formation of Self Help Groups (SHGs) among farm women to promote collective entrepreneurship and provide support for their ventures. These groups played a vital role in facilitating the processing and marketing of jute-based products, such as jute bags and handicrafts. The formation of SHGs provided women farmers with a platform for collaboration, shared learning, and collective bargaining power. The institute provided technical guidance and support to the SHGs, ensuring their sustainability and success in the market.

Empowering farmwomen through skill development programs

Impact of empowerment programs

The implementation of these empowerment programs has had a significant impact on the lives of rural women in West Bengal. They have gained access to innovative tools and technologies, leading to a reduction in drudgery and improved work efficiency. The skill development programs have equipped them with marketable skills, enabling them to diversify their income sources and improve their livelihood security. The formation of SHGs has fostered a sense of collective empowerment, allowing women to participate in the market as producers and entrepreneurs. This has contributed to their financial independence, economic growth, and overall well-being.

Participation of women SHGs in Kolkata Book Fair, 2024

WORKSHOP, SEMINAR & MEETINGS

Workshop on Technology Prioritisation for Agriculture and Allied Sectors (19-20 Aug 2024)

ICAR-CRIJAF, in collaboration with the Technology Information, Forecasting, and Assessment Council (TIFAC), successfully hosted a two-day Technology Prioritisation Workshop for Agriculture and Allied Sectors on August 19-20, 2024, at ICAR-CRIJAF, Barrackpore. This workshop focused on identifying and prioritising climate-resilient technologies for the agriculture and allied sectors, addressing the urgent need for both climate change adaptation and mitigation. The event featured remarks by Dr. G. Kar, Director, and distinguished guests, including Prof. P. Srivastava, Executive Director (DST-TIFAC), and Dr. G. Goswami, Scientist-G (TIFAC). Dr. P. Dey, Director, ATARI-Kolkata, and Dr. B.K. Das, Director, ICAR-CIFRI. The workshop employed the multi-criteria decision analysis technique to evaluate and select the best available technologies that are not only climate-resilient but also socially acceptable, economically viable, and conducive to policy frameworks. Over 50 experts from across the country, specialising in diverse fields such as farm mechanisation, precision agriculture, animal husbandry, fisheries, and emerging climate-resilient technologies, contributed to this process. The outcomes of this workshop may play a crucial role in forming a comprehensive technology database for achieving its climate change objectives.

The 35th Annual Workshop of All India Network Project on Jute and Allied Fibres (22-23 Feb 2024)

The 35th Annual Workshop of AINPJAF was conducted at ICAR-CRIJAF, Barrackpore, Kolkata on 22-23 February 2024. During the inaugural session, Dr T. R. Sharma, Hon'ble DDG (Crop Science) ICAR, served as the Chief Guest, while Dr D. K. Yadava, ADG (Seeds & CC) at ICAR, and Mr A. K. Jolly, MD & Chairman of JCI, were the Guests of Honour. The Workshop was attended by 45 scientists from 9 AINPJAF centres and ICAR-CRIJAF, Barrackpore. Three varieties of JAF crops; each in tossa jute (NJ-7068), white jute (JRC-9) and roselle mesta (AMV-11) have been identified by the Variety Identification Committee chaired by DDG (Crop Science).

Dr T. R. Sharma, Hon'ble DDG (Crop Science) of ICAR is releasing Annual Report-2023 of AINPJAF during workshop

Release of publication during DST-TIFAC Wokshop held at ICAR-CRIJAF

Insights from recent deputation in Australia by Dr. G. Kar (30 Sept. 2024)

Dr. Gouranga Kar, Director of the ICAR-CRIJAF, delivered an insightful seminar on September 30, 2024, sharing his learnings and observations from his deputation to Australia. In his talk, Dr. Kar elaborated on the cutting-edge research, innovative farming practices, and latest agro-technologies being employed in Australia's agriculture sector. Dr. Kar's seminar provided a thought-provoking global perspective and paved the way for future Indo-Australian partnerships in agricultural research and development.

Quality Assurance of Soil Testing Laboratory (14 June 2024)

An Awareness–cum-Capacity Building Programme on "NABL Accreditation and Quality Assurance of Soil Testing Labs" was organised on 14 June 2024. Mrs. Malancha Das, Deputy Director, NABL, Kolkata has given a presentation on NABL accreditation and recognition scheme for soil testing laboratories with an overview of the present status of NABL accredited laboratories in West Bengal. The event was attended by more than 40 participants including scientists and representative from State Agriculture Department and KVKs.

Monthly Seminars of ICAR-CRIJAF

Speaker	Date	Topic	Participants
Dr. Divte P. R., Scientist, ICAR-CRIJAF	8 May 2024	Assessing the functional properties and nutritional values of the roselle calyx and jute leaf for value added product development.	34
Dr. Rakesh Bhowmik Scientist, ICAR-CRIJAF	8 May 2024	Development of molecular market panel for DNA fingerprinting of Jute	34
Dr. Chinmay Biswas Pr. Scientist, ICAR-CRIJAF	8 May 2024	AI based detection and early prediction of stem rot disease in Jute	34
Dr. K. N. Chaurasia Scientist, ICAR-CRIJAF	8 May 2024	Maximising fibre productivity in jute through genetic and agronomical approaches	34
Dr. Gauranga Kar Director, ICAR-CRIJAF	30 Sept 2024	Insights from recent deputation in Australia	27
Dr. Debabrata Sarkar Pr. Scientist, ICAR-CRIJAF	14 Nov 2024	How did it all begin? How will it end? Will it?	55

Glimpses of monthly seminar with scientists of ICAR-CRIJAF during 2024

Research Advisory Committee Meeting

(11-12 December 2024)

The Research Advisory Committee (RAC) meeting of ICAR-CRIJAF, Barrackpore, was held on December 11–12, 2024, under the chairmanship of Dr. P.C. Deka, Vice-Chancellor, Sir Padampat Singhania University, Udaipur (Rajasthan). The committee discussed in detail the research activities of the ICAR-CRIJAF for the period of December, 2023 to November, 2024. The committee was satisfied with the Action Taken Report presented in the meeting. Under the broad mandate of the Institute presented by the Director and Heads of the Division. The RAC made eight specific recommendations for further strengthening of the research activities of the Institute. The following recommendations came out from the deliberations:

1. A systematic molecular breeding program needs to be initiated to develop climate-resilient varieties of jute and allied fibre crops.
2. The jute germplasm should be screened to identify accessions with low-lignin content in the fibre.
3. A detailed study on the host-pathogen interactions, including molecular cross-talks, should be undertaken for better disease management of stem rot.
4. Development of a low-cost jute harvester should be initiated to reduce the cost of cultivation in jute crops.
5. Yield gaps between the experimental fields and farmers' fields need to be addressed efficiently.
6. The alternative potential use of jute and allied fibres for bioethanol, bio-CNG, paper pulp, etc. should be explored.
7. The role of jute in CO_2 sequestration and soil fertility enrichment needs to be standardised under the concept of integrated soil-crop management (ISCM).
8. Alternate minimal water retting technology for mesta should be explored where water is a constraint.

The RAC members Dr. L.M. Garnayak, Dr. T. Sreelata, Dr. A. Bandyopadhyay, Dr. Gouranga Kar, Sh. Mahadev Sarkar, Dr. A.K. Mandal, and member secretary Dr. S. Saha attended the meeting. Dr. R.K. Singh and Dr. P. Das joined the meeting online.

Scientists' Meeting and Farmers' Meet of Research Advisory Committee of ICAR-CRIJAF in HQ and jute growing villages

Institute Research Council Meeting to Review Research Projects (5-6 March, 2024)

The Institute Research Council (IRC) meeting of the year 2023-24 was conducted during 5-6 March 2024 at the Commitee Hall, ICAR-CRIJAF under the chairmanship of Dr. Gouranga Kar, Director. The meeting was attended by all scientists of the institute. All the in-house projects were presented theme-wise and reviewed critically by the Institute Research Council. HoDs, In-charges and other scientists provided valuable suggestions for improving each project. The chairman highlighted ongoing reforms at the ICAR level, emphasing project-based budgeting, Corpus fund utilization, revenue generation, and publication in high impact peer-reviwed jounals. He also urged scientists for their active involvement in undergraduate and post graduate educational activities. Dr. B. Mandal, former Professor (Soil Science) and Dr. S. Bhattacharya, Professor (Genetics & Plant Breeding) of BCKV, West Bengal, were also present as expert members of the IRC.

Institute Management Committee (IMC) Meeting (26th Nov 2024)

The Institute Management Committee (IMC) Meeting of ICAR-CRIJAF was convened on 26 November 2024 at the institute's headquarters in Barrackpore, West Bengal. The daylong meeting covered a comprehensive agenda spanning research and development activities, technology transfer, financial planning, infrastructure upgradation, and human resource management. Attendees deliberated on strategies to enhance the productivity and profitability of jute and allied fibre crops, strengthen linkages with industry and farmers, and address emerging challenges in the sector. The committee members emphasized the expansion of infrastructure and upgradation of existing labs for students of IARI Educational Hub, Kolkata. Dr. G. Kar, Director, ICAR-CRIJAF; Dr. P.K. Dash, ADG (Commercial Crops), ICAR; Dr. G. Saha,Vice-Chancellor, BCKV; Dr. D.R. Bharadwaj, Principal Scientist, ICAR-IIVR; Dr. R.K. Panda, Pr. Scientist, ICAR-IIWM; Dr. D. Kumar, Pr. Scientist, ICAR-IARI; Sri Tapan Sarkar, Addl. Director (Agriculture) and Sri K. Bag, Dy. Director (Horticulture), Govt. of West Bengal; Sri M. Sarkar (Farmer from W.B.), Dr. A.K. Mandal, Nadia (W.B.), Smt. A. Majumdar, FAO (ICAR-NINFET) and Sri R. Mishra, AO, ICAR-CRIJAF, Barrackpore attended the meeting.

Scientists during presentation and discussion of IRC Meeting

Meeting of Institute Management Committee at ICAR-CRIJAF

Industry and Entrepreneurs Meet on Promotion of Jute Based Products (8th February 2024)

Industry and Entrepreneurs Meet-cum-Interaction with Primary Stakeholders on "Potentials of jute and allied fibre crops and promotion of jute-based products" was organised on 8 February, 2024. The program was inaugurated by Dr. S. Gupta, Addl. Chief Secretary, Department of Food Processing Industries & Horticulture, Govt. of West Bengal, along with Dr. D.K. Yadava, ADG (Seed), ICAR, New Delhi, Dr. Pravin Kumar, CEO, Agrinnovate India Ltd., New Delhi, and Mr. D. Mukherjee, Asstt. Director (Marketing), National Jute Board (Kolkata). The program also witnessed the signing of the MoU between ICAR-CRIJAF, Agrinnovate India Ltd., and M/s Creative Pharm for the commercialization and distribution of CRIJAF SONA and CRIJAF developed farm machinery to the farmers.

Interaction Meeting with KVKs of West Bengal (25 January 2024)

An interaction meeting with the heads and in-charges of KVKs in West Bengal on "Roadmap for horizontal expansion and upscaling of ICAR-CRIJAF technologies" was organised on 25th January, 2024. Dr. P. Dey, Director (ICAR-ATARI, Kolkata), Prof. P. Bandopadhyay, Director, Extension, BCKV, along with Dr. G Kar, Director, ICAR-CRIJAF, graced the meeting. Presentations were given on jute and allied fibre varieties, crop production technologies, farm mechanisation, improved retting techniques, diversified uses of fibre crops, and skill development program on jute-diversified products, along with various extension activities under NFSM, SCSP, and TSP. More than 25 KVK officials attended the program.

Interaction meeting with DDAs, West Bengal on Promotion and Upscaling of ICAR-CRIJAF Technologies (27 June 2024).

An interaction meeting with DDAs in West Bengal on "Promotion and upscaling of ICAR-CRIJAF technologies" was organised at ICAR-CRIJAF, Barrackpore, on 27 June, 2024. The objective of this program was to sensitise the state agricultural department officials and line department about ICAR-CRIJAF technologies so as to demonstrate the technologies in the farmers' fields in various districts of West Bengal. Dr. Pradip Dey, Director, ICAR-ATARI, Kolkata, along with Dr. G Kar, Director, ICAR-CRIJAF, presided over the meeting. The event was attended by more than 40 DDAs and their representatives from state agriculture departments from various districts, ICAR-CRIJAF scientists, and KVK officials.

Delegates visiting farm machinery stall of ICAR-CRIJAF during Industry and Entrepreneurs Meet

Participants during KVKs Meet, West Bengal at ICAR-CRIJAF

MoA signing for the commercialization of ICAR-CRIJAF developed jute and flax seed varieties (3rd June 2024)

A MoA signing ceremony for the commercialization of ICAR-CRIJAF-developed jute and flax seed varieties was organised at the ICAR-NBSS & LUP Regional Centre, Kolkata, on 3rd June, 2024. The program was attended by the Hon'ble Secretary, DARE, and Director General, Dr. Himanshu Pathak, along with the directors and heads of the divisions of ICAR institutes located in Kolkata. Jute varieties (JROBA 3 and JROB 2) and flax varieties (JRF 2) were licensed to M/s Delta Agrigenetics Pvt. Ltd., Hyderabad, M/s Bharat Nursery Pvt. Ltd., Kolkata, and M/s KR Lifesciences Pvt. Ltd., Kolkata, for commercialization for the next 5 years.

Scientific Advisory Committee Meeting of KVK, North 24 Parganas (Addl) (25th June 2024)

The 5th Scientific Advisory Committee meeting was organised by KVK, North 24 Prgs (AddL.) on 25 June, 2024. Dr. G. Kar, Director, ICAR-CRIJAF, chaired the meeting and Dr. P. Dey, Director, ATARI Zone-V, graced the meeting online. Dr. K.K. Gangopadhyay, Pr. Scientist, ICAR-IARI; Dr. P.S. Banerjee, Principal Scientist, ICAR-IVRI ERS; Dr. A.K. Das, Pr. Scientist, ICAR-CIFRI; Dr. A.K. Singh, Headquarter In-Charge, KVK; officers from the State Line departments; all the Heads/Incharges of the Divisions/Sections; representatives from FPC; and farmer members attended the meeting. Dr. T. Samajdar, Head, KVK North 24 Parganas (Addl.), presented the action taken report of the 4th SAC Meeting. The annual report-2023 was reviewed, and suggestions were given for improvement of the action plan 2024.

Interaction Meeting for Promotion of Jute & Allied Fibres (28 Oct 2024)

ICAR-CRIJAF organised an important interaction meeting on 28 October, 2024 to discuss the promotion of jute and related crops. The meeting was graced by Shri Dilip Ghosh, former Member of Parliament, who shared his insights on elevating jute's status and increasing its utilisation. During the productive discussion, various strategies were proposed to showcase jute as an eco-friendly, versatile, and economically viable fibre. Ideas included incentivising jute cultivation, supporting jute farmers and entrepreneurs, developing innovative jute products, and spreading awareness about jute's immense potential. The interaction meeting marked a significant step forward in the mission to revitalise the jute industry and sustainable economic growth in the region.

Shri Dilip Ghosh, former Member of Parliament during the presenatation of ICAR-CRIJAF Technology

Participants during SAC meeting of KVK (North 24 Parganas)

Interaction Meeting of CACP and JCI for Collaboration with Industry in Jute Sector (12 Sept 2024)

Members of the Central Agricultural Costs and Prices (CACP), officials from the Jute Corporation of India (JCI), and scientists from ICAR-CRIJAF in Barrackpore convened for an important interaction meeting. The gathering brought together key experts to discuss critical issues facing the jute industry. Topics on the agenda included strategies for enhancing jute cultivation practices, improving yield and fibre quality, and promoting the development of innovative value-added jute products. The meeting provided a valuable platform for the exchange of ideas and the forging of collaborations between policymakers, industry representatives, and the scientific community to help propel the jute sector forward.

Farmer's Expert Interaction Program for Best Agricultural Practices (23 Sept 2024)

An expert interaction program for farmers was held at the Krishi Vigyan Kendra (KVK), Bardhaman on September 23, 2024. The program brought together agricultural scientists, extension officers, and progressive farmers to share knowledge and best practices on the latest advancements in agriculture. Farmers actively participated in the interactive sessions, seeking guidance on challenges faced in their fields and learning about innovative solutions. The program also facilitated peer-to-peer learning, with successful farmers sharing their experiences and inspiring others. Participants gained valuable insights into enhancing crop productivity, increasing profitability, and adopting sustainable agricultural practices. The expert interaction program at KVK Bardhaman with the Director of ICAR-CRIJAF served as an effective platform for knowledge dissemination and capacity building of farmers, contributing to the overall development of the agriculture sector in the district.

Delegates visiting the ICAR-CRIJAF facilities during Intercation programmes

Participations in webinar, seminar, workshop, exhibition & meetings

DIRECTOR

Dr. Gouranga Kar

Centenary Celebration of Bharat Nursery Pvt. Ltd. at Bengal State Room, 5 Jan 2024 at ITC Royal Bengal, Kolkata

National Jute Board meeting, 6 January 2024 at Patsan Bhawan, New Town, Kolkata

260 to 262th meeting of the Executive Council of Bidhan Chandra Krishi Viswavidyalaya, 2 February, 22 Nov. and 13 Dec 2024, BCKV, Mohanpur, W.B.

Conference on "13th Indian Fisheries and Aquaculture Forum: Fostering Indian Fisheries and Aquaculture for attaining Sustainable Development Goals" during 23-25 February 2024 at Kolkata

National Level Workshop on Jute Utilization Strategies on 14 March 2024 at NINFET, Kolkata

World Meteorological Day, 22 March 2024 at BCKV, Mohanpur, W.B.

Review meeting of Jute Industry, 3 April 2024 at Patsan Bhawan, Kolkata

Seminar on Climate Resilient Agriculture Technologies for Islands, 15 May 2024 at CIARI, Port Blair

30th Board Meeting of the National Jute Board, 4 July 2024 at Ministry of Textiles, Udyog Bhawan, New Delhi

4th EC meeting on Strengthening, Up-scaling & Nurturing Innovations for Livelihood (SUNIL), during 22-23 August, 2024 at Swami Rama Himalayan University, Dehradun

9th Asian Regional Conference during 2-9 September, 2024 in Sydney, Australia.

Global Soils Conference 2024 on "Caring Soils Beyond Food Security: Climate Change Mitigation & Ecosystem Services", 19-22 November, 2024 at NASC Complex, New Delhi

9th Asian NIR Symposium (ANS2024) during 8-10 December, 2024, at Biswabangla Convention Centre, Kolkata

SCIENTISTS

AINP on JAF workshop held during 22-23 February, 2024 at ICAR-CRIJAF, Barrackpore- All scientists

39th Annual Group meeting of AICRP on Seed (Crops) during 2-3 May, 2024 at UAS, Bangalore- Dr. Amit Bera

Workshop on Advanced Genomics and Phenomics Tools for Augmenting Crop Nutritional Security in Hill Agriculture during 12-22 June, 2024 at ICAR-VPKAS, Almora- Dr. R. Bhowmick

Awareness-cum-Capacity Building Programme on Quality Assurance of Soil Testing Labs on 14 June, 2024 at ICAR-CRIJAF, Barrackpore- Dr. R. Bhowmick

Group Monitoring Workshop (GMW) on "Scheduled Caste Sub Plan (SCSP) and Tribal Sub Plan (TSP)" 11-12 July 2024 at GITAM University, Visakhapatnam, Andhra Pradesh-Dr. A.K. Singh

Training on Advances in Mobile Application Development (Online Mode) organized by ICAR-NAARM, Hyderabad during 05-09 August, 2024-Dr. M. L. Roy

Annual Progress Review Meeting of the PAC on OEB-Plant Sciences under Anusandhan National Research Foundation (ANRF) held on 12 September, 2024 at ICGEB, New Delhi- Dr. S. Datta, Dr. D. Saha

International Conference on "Building small holder climate resilience for achieving sustainable food systems" (RESILIENCE-2024) at OUAT, Bhubaneswar during 17-19 September, 2024- Dr. M. L. Roy

32nd National Conference of SCSI on Soil, Water and Energy Management for Sustainable Agriculture and Livelihood Security at CSAUAT, Kanpur during 18-20 October, 2024-Dr. M. L. Roy

Global Soils Conference 2024 on "Caring Soils Beyond Food Security: Climate Change Mitigation & Ecosystem Services", 19-22 November, 2024 at NASC Complex, New Delhi- Dr. B. Majumdar, Dr. R. Saha, Dr. D. Barman, Dr. S. P. Mazumdar, Dr. M. L. Roy

National Conference on "Bioenergy India", 27-28 December 2024 at ACEC Pimpri, Pune, Maharashtra-Dr. A.K. Singh

Pedagogy Development Programme on "Enhancing Pedagogical Competencies for Agricultural Education" at National Academy of Agricultural Sciences during year 2024- Dr. R Bhowmick, Dr. S.P. Majumdar, Dr. R.K. De, Dr. S.K. Sarkar, Dr. M.L. Roy, Dr. Shamna A., Dr. R.K. Naik,

Bharat Tex 2024- International Textile Expo at Pragati Maidan, New Delhi during 26-29 February, 2024. Dr. T. Samajdar, Dr. R.K. Naik

96th ICAR Foundation & Technology Day and Exhibition at Subramanium Swamy Auditorium, NASC Complex, New Delhi during 15-16 July, 2024. -Dr. R.K. Naik

Agri Tech Innovate India- 2024 Exhibition at Pragati Maidan, New Delhi during 29-31 August 2024.- Dr. R.K. Naik

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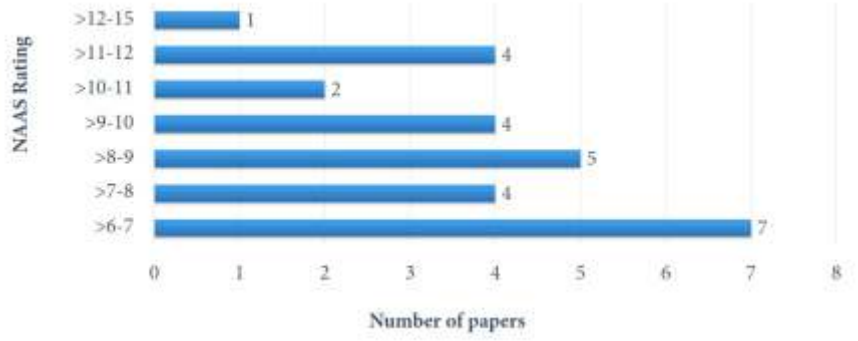

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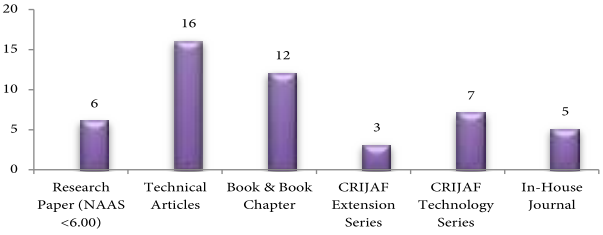
INSTITUTE PUBLICATION

- Annual Report 2023
- Resha Kiran 6(2) 2023; 7(1) 2024
- CRIJAF Bulletin 1(2) 2023; 2(1) 2024



MAJOR EVENTS & CELEBRATIONS

Visit of Secretary, DARE and Director General, ICAR, New Delhi on 19 January 2024

Dr. Himanshu Pathak, Secretary (DARE), and DG (ICAR), visited ICAR-CRIJAF, Barrackpore, on January 19, 2024, and inaugurated the Administrative Building of KVK, North-24 Parganas (additional). He also interacted with farmers, women SHG members, scientists, and staff of the ICAR-CRIJAF. He visited the institutes' Skill Development Centre, Fibre Museum, and Exhibition Hall, where all viable technologies and diversified products have been showcased. During interaction with students of Kolkata hub, he expressed satisfaction with the smooth academic activities of ICAR-CRIJAF. He congratulated the scientists and staff of ICAR-CRIJAF for recent developments in the institute and suggested them to be more vibrant in their activities to meet the transformation being initiated in the Council. Around 400 participants (farmers, farmwomen, SHG members, scientists, and ICAR institute personnel) participated in this program.

ICAR-CRIJAF celebrated 72nd Foundation Day on 9th February, 2024

ICAR-CRIJAF celebrated its 72nd Foundation Day on 9 February, 2024. On this auspicious occasion, Prof. S.K. Datta, Vice Chancellor of Biswa Bangla University and former Deputy Director General (Crop Science, ICAR, New Delhi), graced the occasion as the Chief Guest. He inaugurated the exhibition stalls displaying proven technologies developed by ICAR-CRIJAF, KVKs, and SHGs. He appreciated the institute for putting in excellent effort to increase its visibility among the related stakeholders. Dr. G. Kar, Director, ICAR-CRIJAF, spoke about the reorientation of research projects as need-based and problem-solving technologies.

Visit of Dr. H. Pathak, Director General of ICAR to ICAR-CRIJAF

Foundation Day Celebration and speech by the chief guest Prof. S.K. Datta, Former DDG (CS), ICAR

Global Campaign on Tree Plantation

On 17 September 2024, the ICAR-CRIJAF organised an impactful tree plantation program as part of a larger global campaign to promote environmental sustainability. The event brought together researchers, staff members, and local community volunteers who joined hands to plant a diverse array of tree saplings on the institute's campus and surrounding areas. This initiative not only aimed to increase the region's green cover but also sought to raise awareness about the crucial role that trees play in combating climate change, preserving biodiversity, and supporting human well-being. By actively participating in this global campaign, ICAR-CRIJAF demonstrated its commitment to environmental stewardship and inspired others to take steps towards building a greener, more sustainable future for generations to come.

Formation of Human Chain for Cleanliness and Sanitation

On 21 September 2024, all staff at ICAR-CRIJAF came together to form an impressive human chain, standing united to raise awareness about the vital importance of cleanliness and sanitation. The event served as a powerful demonstration of the institute's steadfast commitment to maintaining hygienic conditions and promoting public health. By joining hands in solidarity, the ICAR-CRIJAF team sent a resounding message about the need for each and every individual to take responsibility for keeping their surroundings clean and sanitary. The human chain was a striking visual representation of the strength that comes from collective action towards a common goal of improved hygiene and community well-being.

75th Republic Day & 78th Independence Day of India Celebration

ICAR-CRIJAF celebrated its 75th Republic Day on 26th January and 78th Independence Day on 15th August 2024 with pride and remembered the great scarifies made by freedom fighter of the country. Dr. Gouranga Kar, Director, hoisted the national flag, followed by the recitation of the national anthem. All Scientists, students and staff conveyed the message of Republic Day on this occasion.

Global Campaign on Tree Plantation by women staff of ICAR-CRIJAF

Formation of human chain by staff of ICAR-CRIJAF for cleanliness and sanitation

World Soil Day 2024 Celebrated on 5th December

ICAR-CRIJAF, Barrackpore, celebrated World Soil Day on 5th December, 2024, under the theme 'Caring for Soils: Measure, Monitor, and Manage'. Director, ICAR-CRIJAF, delivered a keynote address, where he emphasised two key environmental and agricultural issues: the importance of healthy soils and the availability of pure water for growing nutritious crops, while pure water is essential for agriculture and maintaining ecosystem balance. The chief guest, Shri D. Dey, IPS, Addl. CP (SB), Kolkata Police (W.B.), emphasised the importance of soil health as a key to environmental and human health. Dr. A. Biswas, Professor and OAC Chair in Soils and Precision Agriculture, School of Environmental Sciences, University of Guelph (Canada), made a comprehensive presentation on information-driven soil management for sustainability. Soil health cards were distributed to farmers from different villages of Hooghly and North 24 Parganas districts of West Bengal. A demonstration of drone-based precise nutrient application was also organised on this occasion. Around 200 participants, including farmers, scientists, technical personnel, students, and staff of ICAR-CRIJAF, participated in this program.

Health Camp For Sanitation

ICAR-CRIJAF demonstrated its commitment to community welfare and holistic well-being by organising a comprehensive health camp on 26 September 2024. The health camp brought together a diverse group of beneficiaries, including sanitation workers, agricultural labourers, farmers, students, scientists, and other staff members. This inclusive approach aimed to provide essential healthcare services and raise awareness about the importance of preventive care and early detection of health issues. The health camp served as a vital platform for individuals from various walks of life to access quality medical care, undergo health screenings, and receive valuable guidance on maintaining optimal well-being. Through this initiative, ICAR-CRIJAF reaffirmed its role as a socially responsible institution, actively contributing to the overall development and welfare of the region.

Soil Health Card distribution during World Soil Day 2024

Health camp organised by Staff Recreation Club of ICAR-CRIJAF

Vigilance Awareness Week-2024: Say No to Corruption

The Valedictory Ceremony of Vigilance Awareness Week-2024 was held on 6 November 2024, to mark the conclusion of a week-long campaign promoting integrity, transparency, and accountability in public offices. The ceremony featured speeches by the director and administrative officials emphasising the critical importance of upholding vigilance norms and ethical conduct standards for all government employees. Attendees, who included staff of all levels from ICAR-CRIJAF, were reminded of their solemn duty to act as guardians of public trust and to never engage in or tolerate any form of corruption. The ceremony served to reinforce the message that adherence to vigilance guidelines is essential for good governance and for maintaining the credibility of public institutions in the eyes of citizens.

Tree plantation program Ek Ped Maa Ke Naam campaign in Sundarban

ICAR-CRIJAF organised a massive tree plantation drive in Kultali, Sundarban (West Bengal) on 24 September, 2024, as part of the "Ek Ped Maa Ke Naam" (One Tree in Mother's Name) campaign. This noble initiative aimed to promote environmental conservation and pay tribute to mothers by planting trees in their honour. The event witnessed enthusiastic participation from local communities and ICAR-CRIJAF members, who came together to plant a wide variety of native tree species across the region. By focusing on an ecologically sensitive area like the Sundarbans, this program not only contributed to expanding the green cover but also raised awareness about the crucial role of trees in preserving biodiversity, mitigating climate change effects, and protecting the unique mangrove ecosystem. ICAR-CRIJAF's commitment to sustainable practices and community engagement was exemplified through this impactful tree plantation drive, leaving a lasting positive impact on the environment and the hearts of those involved. On this occasion, 1500 mango (cv. Amrapalli and Mallika) saplings were distributed and planted. The program was attended by more than 1200 farm women and the representatives of press and media.

Distribution of plant saplings by the Director to Farm women of Sundarban during "Ek Ped Maa Ke Naam"

Distribution of prizes to participants of Vigilance Awareness Week-2024 of ICAR-CRIJAF

Kisan Diwas 2024

ICAR-CRIJAF organised the Kissan Diwas Programme at Kultali, Sundarban, in association with the Kultali Milan Tirtha Society, West Bengal, on 23 December 2024. Prof. Panjab Singh, former Secretary (DARE) and DG (ICAR), former VC, BHU, and present Chancellor, RLBCAU, Jhansi, was the chief guest of this program. Prof. P. Srivastava, Executive Director, and Dr. G. Goswami, Head, TIFAC, DST were present as guests of honour. Mr. Lokman Molla, Chairman, Kultali Milan Tirtha Society, was also present. During the program, a research-extension-farmer interface meeting was conducted. Prof. Panjab Singh emphasised the commitment of the institute in providing technological support and skill development for the overall livelihood security of the small and marginal farmers of Sundarban. On this occasion, various agricultural inputs like certified paddy seeds (2500 kg), backyard poultry chicks (1500 nos.), poultry feed (2500 kg), vegetable seed kits (1500 nos.), vermi-bed (100 nos.), minor irrigation kits (100 nos.), sprayer machines (75 nos.) were distributed to the farmers. The program was attended by more than 2000 farmers, farm women, and the representatives of press and media.

Programme ESPERANZA for Students of IARI-Kolkata

The IARI-Kolkata Hub recently organised a Freshers' Welcome Programme, dubbed ESPERANZA, for the newly admitted students on 29 November 2024. The event, aimed at helping the freshers feel at home in their new academic environment, featured a delightful cultural program that showcased the diverse talents of both current students and the newly admitted batch. From mesmerising dance performances representing various regional styles to soulful musical renditions and thought-provoking dramatic acts, the cultural extravaganza had it all. The program not only entertained the audience but also provided a platform for the freshers to bond with their seniors and peers in a fun-filled and relaxed atmosphere. Overall, ESPERANZA set the perfect tone for the start of the academic year, making the freshers feel welcomed, celebrated, and eager to contribute to the vibrant campus life.

Prof. Panjab Singh addressing the farmers during Kisan Diwas in Sundarban, West Bengal

AWARDS, FELLOWSHIPS & RECOGNITIONS

- क्षेत्रीय राजभाषा पुरस्कार: भारत सरकार, गृह मंत्रालय, राजभाषा विभाग द्वारा दिनांक 8 मार्च, 2024 को सिलीगुड़ी क्षेत्रीय राजभाषा सम्मेलन में संस्थान को संघ की राजभाषा निति के उत्कृष्ट कार्यान्वयन तथा राजभाषा के प्रगामी प्रयोग के लिए वर्ष 2022-23 के लिए क्षेत्रीय राजभाषा पुरस्कार (प्रथम) से सम्मानित किया गया।
- **Technology development Certificate- 2024 by the ICAR**
  - Lifecycle assessment of carbon footprint from jute and kenaf made products as alternative to plastics- Dr. Arvind Kumar Singh, Principal Scientist
  - Identification of jute cultivars for their ozone sensitivity/tolerance using ethylenediurea in West Bengal, India- Dr. Arvind Kumar Singh, Principal Scientist
  - Agro-technology for optimization of sulphur application in jute and mesta cultivation- Dr. Sonali Paul Mazumdar, Senior Scientist
  - Decision support system for extension of disease pest management protocols in jute and mesta- Dr. N.M. Alam, Sr. Scientist
  - CRIJAF Advice for dissiminating farm knowledge to jute and allied farmers - Dr. N.M. Alam, Sr. Scientist
- **Best Oral Presentation Awards** at 32nd National conference of SCSI on soil, water and energy management for sustainable agriculture and livelihood security" at CSAUAT, Kanpur (18-20 October,2024) -Dr. M. L. Roy, Sr. Scientist
- **Lead paper presentation** on 'The Potential of Lignocellulosic Biomass of Jute for Biofuel Production' at National Conference on "Bioenergy India", 27-28 December 2024 at ACEC Pimpri, Pune, Maharashtra-Dr. A.K. Singh, Principal Scientist
- **2nd Rank for Excellence Achievements Stall** in 'Agri Tech Innovate India' Agri Tech Innovate India- 2024 Exhibition at Pragati Maidan, New Delhi during 29-31 August 2024.
- **ICAR Observer for ICAR Entrance Examination (PG/PhD)** at Examination Centre (Sambalpur, Odisha) conducted by NTA, New Delhi on 29.06.2024- Dr. R.K. Naik, Principal Scientist

Dr. R.K. Naik, Principal Scientist receiving Award for 2nd Rank for Excellence Achievements Stall of ICAR-CRIJAF at New Delhi

Dr. M.L. Roy, Senior Scientist receiving Best Oral Presentation Awards at 32nd National conference of SCSI at Kanpur

OFFICIAL LANGUAGE IMPLEMENTATION

हिन्दी कार्यशाला का आयोजन

भाकृअनुप-केंद्रीय पटसन एवं समवर्गीय रेशा अनुसंधान संस्थान, बैरकपुर, कोलकाता में दिनांक 16 फरवरी, 26 जून, 27 सितम्बर, एवं 30 दिसम्बर 2024 को संस्थान के अधिकारियों एवं कर्मचारियों के कार्यालयीन कार्यों में हिन्दी के प्रयोग को तीव्र गति प्रदान करने के उद्देश्य से एक दिवसीय हिन्दी कार्यशाला का आयोजन किया गया। दिनांक 16 फरवरी के कार्यशाला में मुख्य वक्ता के रूप में डॉ. चंद्र गोपाल शर्मा, पूर्व-उप महाप्रबंधक (राजभाषा), पूर्व रेलवे, कोलकाता को आमंत्रित किया गया था। उन्होंने भारत संघ की राजभाषा के रूप में हिन्दी की वैधानिक यात्रा, भारत सरकार में विद्यमान बाध्यकारी द्विभाषिकता : अधिकारियों के दायित्व, संसदीय राजभाषा समिति, भारतीय लिपियों की वैज्ञानिकता एवं कम्प्यूटर कार्य तथा कार्यालय में हिन्दी कार्य के अंतर्गत प्रोत्साहन योजना के साथ राजभाषा विभाग, गृह मंत्रालय, भारत सरकार के वार्षिक लक्ष्यों तथा अन्य विषयों पर चर्चा करते हुए धारा ३(३) के अंतर्गत आने वाली सभी दस्तावेजों का द्विभाषी रूप में जारी करने संबंधित विषय पर जोर दिया गया। कार्यशाला में उपस्थित संस्थान के सभी प्रभागाध्यक्षों, प्रभारियों, अधिकारियों तथा कर्मचारियों को डॉ. शर्मा ने संघ की राजभाषा नीति के उत्कृष्ट कार्यान्वयन तथा राजभाषा के प्रगामी प्रयोग हेतु क्षेत्रीय राजभाषा पुरस्कार हेतु निदेशक महोदय, हिन्दी कक्ष एवं संस्थान के सभी कर्मचारी सदस्यों को हार्दिक बधाई एवं शुभकमनाएं दिया एवं भूरी-भूरी प्रशंसा की।

दिनांक 27 सितम्बर के कार्यशाला में श्री अनवर हुसैन, प्राध्यापक, सरोजनी नायडू कालेज फॉर वुमेन को हिन्दी कार्यशाला हेतु आमंत्रित किया गया था। श्री हुसैन ने कार्यशाला के दौरान हिन्दी की महत्ता को साझा करते हुए कहा कि साहित्यकारों ने लगभग एक हजार वर्षों के हिन्दी साहित्य के इतिहास को चार काल-खण्डों में विभाजित किया है, जिसके तीन काल खण्ड को काव्य-प्रधान माना गया है। उन्होंने अपनी व्याख्यान में आदिकाल से लेकर आधुनिक काल के विषय में संक्षिप्त सोदाहरण देते हुए कहा कि कविता, कहानी, उपन्यास व अन्य साहित्यिक विधाओं के लिए पहचानी जाने वाली हिन्दी आज ज्ञान-विज्ञान, वाणिज्य तथा प्रौद्योगिकी का सशक्त माध्यम बन चुकी है। आज हिन्दी को इसकी सहजता के कारण विश्व की तीसरी सबसे बड़ी भाषा के रूप में अंगीकार किया गया है। यह हिन्दी की सरलता ही है कि इसे सर्वाधिक बोली व समझे जानी वाली भाषा के पायदान पर पहुँचा दिया है। इसके अतिरिक्त उन्होंने राजभाषा नीति, नियम, अधिनियम तथा राजभाषा कार्यान्वयन के संबंध में भी रोचक व्याख्यान के माध्यम से परिचर्चा भी की।

30 दिसम्बर 2024 के कार्यशाला में डॉ. विचित्रसेन गुप्त, उप निदेशक(कार्यान्वयन),राजभाषा विभाग, गृह मंत्रालय, भारत सरकार, क्षेत्रीय कार्यान्वयन कार्यालय (पूर्व क्षेत्र), कोलकाता ने राजभाषा हिन्दी के प्रगामी प्रयोग को बढ़ावा देने तथा राजभाषा संबंधी अधिनियमों, नियमों एवं आदेशों के अनुपालन विषय पर ससंदर्भ व्याख्यान प्रस्तुत किया गया। अतिथि वक्ता ने पावर प्वाइंट प्रस्तुति के माध्यम से कार्यशाला के सामयिक विषय पर विस्तृत व्याख्यान देते हुए कार्यक्रम को आगे बढ़ाया।

हिन्दी कार्यशाला के दौरान संस्थान के निदेशक, डॉ. गौरांग कर ने अपने अध्यक्षीय सम्बोधन में समस्त अधिकारियों एवं कर्मचारियों को हिन्दी के इतिहास की जानकारी का पुर्नस्मरण करते हुए कार्यालयीन कार्यों में राजभाषा हिन्दी के अधिकाधिक प्रयोग करने पर ज़ोर दिया। निदेशक महोदय ने हिन्दी के सरल, सुबोध एवं आसान शब्दों के प्रयोग करने पर भी बल दिया। उन्होंने कार्यशाला में उपस्थित सभी अधिकारियों एवं कर्मचारियों से अपील किया कि वे अपने-अपने दैनिक कार्यालयीन कार्यों में राजभाषा हिन्दी का प्रयोग सुनिश्चित करें। प्रथम कार्यशाला में कुल 46 कार्मिकों (26 अधिकारी एवं 20 कर्मचारी) ने भाग लिया। द्वितीय कार्यशाला में कुल 75 कार्मिकों (45 अधिकारी एवं 30 कर्मचारी) तथा संस्थान में अध्ययन कर रहे लगभग 27 छात्र छात्राओं ने भाग लेकर ज्ञानार्जन किया। तृतीय कार्यशाला में कुल 75 कार्मिकों (43 अधिकारी एवं 32 कर्मचारी) ने भाग लिया।

हिन्दी पख़वाड़ा का आयोजन

भाकृअनुप-केन्द्रीय पटसन एवं समवर्गीय रेशा अनुसंधान संस्थान, बैरकपुर, कोलकाता में दिनांक 13-27 सितम्बर, 2024 तक हिन्दी पखवाड़ा का आयोजन किया गया। उद्घाटन समारोह के अध्यक्ष एवं संस्थान के निदेशक, डॉ. गौरांग कर ने अपने संबोधन में कहा कि संविधान सभा द्वारा राज-काज चलाने के लिए तथा केन्द्र व राज्यों के बीच सम्पर्क भाषा की भूमिका निभाने का उत्तरदायित्व हिन्दी को ही सौंपा है, क्योंकि यह देश के अधिकांश भागों में बोली व समझी जाती है। उन्होंने कहा कि हमें केवल हिन्दी पखवाड़ा मनाने मात्र तक ही सीमित नहीं रहना चाहिए, बल्कि यह संकल्प भी लेना चाहिए कि हम अपना अधिकाधिक कार्यालयीन कार्य हिन्दी में करने का प्रयत्न करें।

हिन्दी पखवाड़ा-2024 के अन्तर्गत विभिन्न हिन्दी प्रतियोगिताओं का आयोजन किया गया। दिनांक 13 सितम्बर, 2024 को तात्कालिक भाषण प्रतियोगिता, दिनांक 17 सितम्बर, 2024 को कम्प्यूटर पर हिन्दी टंकण प्रतियोगिता, दिनांक 18 सितम्बर, 2024 को हिन्दी निबंध लेखन प्रतियोगिता, दिनांक 19 सितम्बर, 2024 को हिन्दी अनुवाद प्रतियोगिता, दिनांक 20 सितम्बर, 2024 को हिन्दी टिप्पण एवं मसौदा लेखन प्रतियोगिता, दिनांक 23 सितम्बर, 2024 को हिन्दी श्रुतलेखन एवं पठन प्रतियोगिता तथा दिनांक 24 सितम्बर, 2024 को वाद-विवाद प्रतियोगिता का आयोजन किया गया। इन सभी प्रतियोगिताओं में संस्थान के सभी वर्गों के अधिकारियों व कर्मचारियों ने उत्साहपूर्वक भाग लिया।

दिनांक 27 सितम्बर, 2024 को अत्यंत उत्साह पूर्ण वातावरण में हिन्दी पखवाड़ा का समापन एवं पुरस्कार वितरण समारोह का आयोजन किया गया। विभिन्न प्रतियोगिताओं में प्रथम, द्वितीय व तृतीय स्थान प्राप्त करने वाले अधिकारियों/कर्मचारियों को निदेशक महोदय, डॉ. गौरांग कर तथा श्री अनवर हुसैन, प्राध्यापक, सरोजनी नायडू कालेज फॉर वुमेन के कर कमलों द्वारा पुरस्कृत किया गया। साथ ही हिन्दी प्रोत्साहन योजना 2023-24 में सम्मिलित 05 (पाँच) अधिकारियों तथा कर्मचारियों को भी पुरस्कार प्रदान किया गया।

हिन्दी-पखवाड़ा-2024 के दौरान निदेशक एवं अधिकारीगण पुरस्कार वितरण करते हुए

राजभाषा कार्यान्वयन समिति की बैठक

संस्थान में राजभाषा कार्यान्वयन समिति की चार बैठकें क्रमशः दिनांक 22.03.2024, 30.05.2024, 30.09.2024 एवं 20.12.2024 को माननीय निदेशक, डॉ. गौरांग कर जी की अध्यक्षता में आयोजित की गई। इन बैठकों में संस्थान में हो रही विभिन्न गतिविधियों में हिन्दी के प्रगतिशील प्रयोग के तरीकों और साधनों पर चर्चाएं की गई। इसके अलावा इन बैठकों में संस्थान के अधिकारियों एवं कर्मचारियों को राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम (2024-25) के अनुसार "ग" क्षेत्र के लिए निर्धारित 55 प्रतिशत लक्ष्यों पर भी चर्चा की गई। सभी बैठकों के अंत में अध्यक्ष महोदय के प्रति धन्यवाद ज्ञापन के साथ बैठक समाप्त हुई।

महत्वपूर्ण उपलब्धियाँ

संस्थान ने प्रशासन के क्षेत्र में भी काफी महत्पूर्ण उपलब्धियाँ प्राप्त की हैं :

1) भारत सरकार की राजभाषा नीति के प्रावधानों, राजभाषा अधिनियम, 1963 और उक्त अधिनियम के तहत बनाए गए राजभाषा नियम, 1976 का कार्यान्वयन किया जाता है।
2) हिन्दी का कार्यसाधक ज्ञान रखने वाले अधिकारियों / कर्मचारियों के लिए जुलाई-दिसम्बर माह के दौरान दो हिन्दी कार्यशालाओं का आयोजन किया गया है।
3) राजभाषा विभाग, गृह मंत्रालय द्वारा समय-समय पर जारी आदेशों का कार्यान्वयन किया जाता है।
4) राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम का क्रियान्वयन किया जाता है।
5) संस्थान की राजभाषा कार्यान्वयन समिति से संबंधित सभी मामलों पर एजेंडा नोट्स तैयार कर तथा बैठकों का आयोजन व तत्पश्चात कार्यवृत्त तैयार कर उन पर अनुवर्ती कार्रवाई की जाती है।
6) संस्थान की राजभाषा कार्यान्वयन समिति की बैठकों में होने वाली चर्चायें सिर्फ और सिर्फ हिन्दी में की गयी हैं तथा उसे अमल में लाया जाता है।
7) विहित फार्मों एवं सभी मानक मसौदे द्विभाषी रूप में तैयार किए गए हैं।
8) रजिस्टरों के शीर्षक द्विभाषी रूप में तैयार किए गए हैं।
9) संस्थान में सभी रबर की मोहरें, नाम पट्ट, शीर्षक-पत्र इत्यादि द्विभाषी में तैयार किए गए हैं।
10) संस्थान में धारा 3(3) के अन्तर्गत आने वाले संस्थान के सभी दर आमंत्रण, निविदा-प्रपत्र, निविदा सूचनाएं एवं बिक्री सूचनायें आदि द्विभाषी रूप में जारी किए जाते हैं।
11) संस्थान की विभिन्न बैठकों में होने वाली चर्चायें भी अधिकांशत: हिन्दी में ही की गयी हैं।
12) अन्य भाषा-भाषी लोगों के हिन्दी शब्द ज्ञान हेतु प्रतिदिन हिन्दी का एक शब्द 'आज का शब्द' लिखा जाता है।
13) हिन्दी अनुभाग में प्रविष्टियाँ, टिप्पणी एवं मसौदा लेखन व अन्य कार्य हिन्दी में ही किए गए हैं तथा अन्य अनुभागों में भी अधिकांश प्रविष्टियाँ, टिप्पणी एवं मसौदा लेखन हिन्दी में ही करने के निर्देश दिए गए हैं।
14) संस्थान के सभी कम्प्यूटरों में द्विभाषी रूप में काम करने के लिए यूनीकोड की सुविधा उपलब्ध कराई गयी है।
15) नगर राजभाषा कार्यान्वयन समिति' कोलकाता (कार्यालय-2), सीएसआईआर-केंद्रीय काँच एवं सिरामिक अनुसंधान संस्थान, कोलकाता) की छमाही बैठकों में संस्थान की ओर से संस्थान के निदेशक सहित अन्य अधिकारी भाग लेते हैं।
16) प्रशासनिक अनुभागों सहित अन्य प्रभागों में भी टिप्पणी तथा मसौदा लेखन आदि कार्य ई-ऑफिस के माध्यम से हिन्दी में किए जा रहे हैं।
17) हिन्दी में प्राप्त पत्रों के उत्तर शत-प्रतिशत हिन्दी में दिए जाते हैं।

KNOWLEDGE MANAGEMENT & TECHNOLOGY COMMERCIALIZATION

CRIJAF Library: Information and Documentation Unit

Library continued its support for research activities of the institute by subscribing to electronic resources and providing various information services of all kinds of scientific and technical information on jute and allied fibres like mesta, ramie, sisal, sunnhemp and flax.

Virtual library through CeRA platform: Library continued to provide this service to enable users to access subscribed from a single portal, irrespective of place and time. It helps a lot to users especially during Covid-19 pandemic lockdown period.

Scientific books: Presently, it holds about 10,000 books under various themes of agriculture and allied sectors like agronomy, soil science, genetics & plant breeding, plant pathology, agricultural entomology, agricultural extension, plant physiology, bio-technology, agricultural engineering, etc. from national and international publishers. Besides, library also procured general books like stories, economics and politics in Hindi, English and Bangla languages.

Scientific journals: The library is enriched with 39 International and 106 Indian journals and digital version of international bibliographic information system for the agricultural sciences and technology (AGRIS).

The library has about 9230 bound volumes of journals and scientific literatures since 1947.

Annual reports: To keep abreast of the activities of the Institute, the library sends the Annual Reports, Newsletters (JAF news) and Technical bulletins of ICAR-CRIJAF to various research organizations including Universities and Developmental Departments of the States. Library also holds the annual reports/newsletters/technical bulletins of various ICAR Institutes and SAU's, Commission/Committee reports.

Software support for library information: An open source library management software (KOHA) installed and database management of library books.

Digitization of documents: Library started digitization of all kinds of scientific and technical information of the institute.

Reprographic and photographic facility: This facility meet photography, photocopying and printing requirements of the institute for the research and administrative purposes of the institute.

Exhibition-cum-Fibre Museum: To showcase ICAR-CRIJAF technologies on fibre and fibre based products, anexhibition-cum-fibre museum has been established.

Registration and IPR Protection

Copyright of 'JAF Safe' and 'JUTEMET'

- Copyright application for '**JAF Safe**', an Android Mobile App for Jute and Allied Fibre Crops Pest Management has been registered by the Copyright Office, Govt. of India (Copyright Registration No. A-149973/2023) on 19.12.2023.
- Copyright application for '**JUTEMET**', a web-based agrometeorological database management system (ADBMS)-cum-agroadvisory system for management of climate data has been registered by the Copyright Office, Govt. of India (Copyright Registration No. A-154151/2024) on 25.06.2024.

Trademark of 'JuteWAT'

Trademark application of '**JuteWAT**' logo has been registered under Trade Mark Act, 1999 of Section 23 (2), Rule 56(1) by Trade Marks Registry Office, Govt. of India (Trade Mark No. 6127737 in Class 42 Dated 27/09/2023) with validity up to ten years (26.09.2033).

Technology Commercialization and Registration

ICAR-CRIJAF developed 03 Jute and Flax varieties and 03 technologies/products were commercialized during this period reported upon. The details are as follows:

Sl. No.	Name of the technology/variety	Name of the Licensee(s)	Mode of Partnership	Date of Licensing
1.	CRIJAF Jute Seeder	M/s Krishi Udyog, W.B	MoA signed via mediation of Agrinnovate Pvt. Ltd., New Delhi	19.01.2024
2.	CRIJAF Jute Ribonner	M/s Krishi Udyog, W.B	MoA signed via mediation of Agrinnovate Pvt. Ltd., New Delhi	19.01.2024
3.	CRIJAF SONA	M/s Creative Pharm, W.B M/s M R Aquatech, Odisha	MoA signed via mediation of Agrinnovate Pvt. Ltd., New Delhi	08.02.2024 09.08.2024
4.	Nail Weeder	M/s Krishi Udyog, W.B M/s Creative Displayers, W.B	Institutional MoA Institutional MoA	27.08.2024 03.10.2024
5.	CRIJAF Jute variety (JROBA-3)	M/s Bharat Nursery Pvt. Ltd., Kolkata M/s Delta Agrigenetics Pvt. Ltd., Hyderabad	Institutional MoA	03.06.2024
6.	CRIJAF Jute variety (JROB-2)	M/s Delta Agrigenetics Pvt. Ltd., Hyderabad	Institutional MoA	03.06.2024
7.	CRIJAF Flax variety (JRF-2)	M/s KR Lifesciences Pvt. Ltd., Kolkata	Institutional MoA	03.06.2024

Royalty Earned

A total amount of Rs 91,94,062/- has been received as licensing fees and royalty payment of various commercialized technologies (CRIJAF seeds, CRIJAF SONA, CRIJAF Multi Row Seed Drill, CRIJAF Nail Weeder, CRIJAF Single Wheel Jute Weeder, CRIJAF Jute Ribboner and CRIJAF Jute Seeder) from authorized manufacturer and sellers during 2024.

MoA signing ceremony for the commercialization of ICAR-CRIJAF-developed jute and flax seed varieties

DISTINGUISHED VISITORS

1.	**Dr. Himanshu Pathak** Secretary (DARE) & Director General (ICAR), New Delhi	19.01.2024
2.	**Dr. Punjab Singh** Former Secretary (DARE) & Director General (ICAR), Former Vice-Chancellor, BHU, and Chancellor, RLBCAU, Jhansi	23.12.2024
3.	**Dr. K. Narsaiah** Assistant Director General (Process Engineering), ICAR, New Delhi	03.01.2024
4.	**Dr. D. K. Yadava** Assistant Director General (Seeds), ICAR, New Delhi	08.02.2024
5.	**Dr. Sanjeev Gupta** Assistant Director General (Oilseed and Pulses), ICAR, New Delhi	19.01.2024
6.	**Dr. Gautam Saha** Ex Vice-Chancellor, Bidhan Chandra Krishi Viswavidyalaya	19.01.2024
7.	**Swami Madhabananda Saraswati** Secretary, Dalpur Sree Sree Gyanananda Saraswati Ashram, Bankura	25.01.2024
8.	**Dr. Pradip Dey** Director, ICAR-ATARI, Kolkata	25.01.2024
9.	**Sri Subrata Gupta** Chief Joint Secretary, Govt. of West Bengal	08.02.2024
10.	**Dr. Praveen Malik** Chief Executive Officer (CEO), Agrinnovate	08.02.2024
11.	**Dr. Malavika Dadlani** Former Joint Director (Research), IARI, New Delhi	09.02.2024
12.	**Commdr. A.K. Jolly** MD, JCI, Kolkata	09.02.2024
13.	**Dr. A.K. Bera** Director, ICAR-Directorate of Groundnut Research, Junagadh	19.01.2024
14.	**Dr. Gautam Goswami** Head, TIFAC, DST, GoI	04.06.2024
15.	**Dr. Pradeep Kumar Sharma** Vice-Chancellor, SKUAST, Jammu	12.07.2024
16.	**Prof. Manoranjan Kar** Former Vice-Chancellor, OUAT, Bhubaneswar	16.07.2024
17.	**Shri Shashi Bhushan Singh** Secretary, National Jute Board, Kolkata	02.08.2024
18.	**Prof. Pradeep Srivastava**, Executive Director, TIFAC, DST, New Delhi	19.08.2024
19.	**Dr Naveen P Singh** Member, CACP, Ministry of Agriculture and Farmers Welfare, New Delh	12.09.2024
20.	**Sri Ratan Lal Daga**, Member, CACP Ministry of Agriculture and Farmers Welfare, New Delhi	12.09.2024
21.	**Comdt. Sujeet Kumar**, 32BN BSF, Nadia, West Bengal	04.10.2024
22.	**Dr. Hari Chand Sharma** Former Vice-Chancellor, YSP Univ. of Horticulture and Forestry, Solan	04.10.2024
23.	**Sri Sudipta Porel** Joint Secretary, W.B. Minorities Development & Financial Corporation Ltd.	18.09.2024
24.	**Sri Dilip Ghosh** Former Member of Parliament (Medinipur), West Bengal	25.11.2024
25.	**Dr. Mahadev Bar**, Research Engineer, University of Florida	09.12.2024
26.	**Prof. Pradip Chandra Deka** Former Vice Chancellor, Tezpur Central University, Assam	11.12.2024
27.	**Prof. L. M. Garnayak,** Director of Research, Central Agril. University, Imphal	11.12.2024
28.	**Dr. T. Sreelatha**, Sr. Professor & Head, Acharya N.G. Ranga Agricultural University	11.12.2024
29.	**Dr. Abhijit Bandyopadhyay,** Professor, University of Calcutta	11.12.2024

RESEARCH PROJECTS

Externally Funded Projects

	Project Title	Investigators	Funding Agency	Duration
1.	Genome sequencing and functional genomics of bast fibre quality	D. Sarkar	ICAR-NPFGGM-3070	2021-26
2.	Prospecting heat stress tolerance through genome-edited heat shock factors and NAC-domain transcription factors in flax (*Linum usitatissimum*)	D. Saha	CRG/2021/001317	2022-25
3.	Enhancing climate resilience and ensuring food security with genome editing tools	S. Datta	ICAR-CS-EFC scheme	2024-26
4.	Bioethanol from lignocellulose biomass (jute and kenaf-mesta): a green fuel for climate change mitigation	P. Satya	NICRA	2022-24
5.	In-season smart sensor enabled advanced technological Interventions for real time water management of jute crop for adaption in SC farmers field under changing climate scenario	A. K. Singh	DST-SEED	2023-26
6.	Jute- improved cultivation and advanced retting exercise (JUTE-ICARE)	B. Majumdar	NJB	2015-26
7.	Assessment of vulnerability of jute production to climate change and its mitigation strategies development using remote sensing GIS in West Bengal	D. Barman	STBT-ST SE	2018-25
8.	Quantitative assessment of carbon and moisture fluxes over jute based agro-ecosystems: integrating ground observations, satellite data and modeling	D. Barman	ISRO-NCP	2018-25
9.	Development of minimal water retting technology in jute	B. Majumdar	NASF/FME-9022/2022-23	2022-25
10.	IP Facilitation centre under MSME	C. Biswas	TD-IPR-DCMSME	2023-25
11.	Technologic and economic empowerment of SC farm families to mitigate the impact of COVID-19 through jute fiber based farming, value addition and value chain establishment	Shamna A.	DST-SEED	2021-24
12.	Commercial crops jute-based cropping system	C. S. Kar	NFSM-CC	2015-Long Term
13.	AICRP on seeds (crops)	C. S. Kar	AICRP (Seeds)	2000-Long Term
14.	Protection of jute varieties and DUS testing project	A. Bera	PPV& FRA	2005-Long Term
15.	Development of descriptors for DUS testing of mesta (Kenaf and Roselle)	A. Bera	PPV&FRA	2019-Long Term
16.	To study changes in soil quality, crop productivity and sustainability under jute-rice-wheat cropping system	B. Majumdar	AICRP-LTFE	1971-Long-Term
17.	Soil test and resource based integrated plant nutrient supply system for sustainable agriculture	S.P. Mazumdar	AICRP-STCR	2007-Long-Term

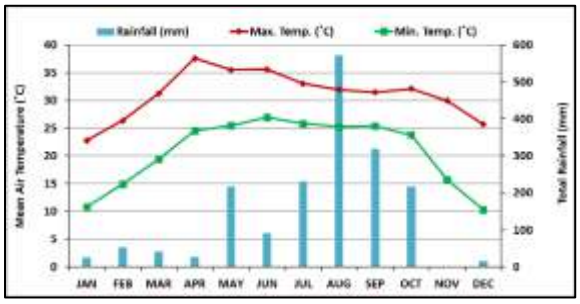
Institute Projects

	Project Title	Investigators	Duration
Crop Improvement			
1.	Introduction, maintenance, characterization and conservation of jute, mesta and flax germplasm	Jiban Mitra	Long-Term
2.	Genetic improvement of flax (*Linum usitatissimum*) for higher fibre productivity and fibre quality	Jiban Mitra	2016-2025
3.	Maximising fibre productivity in jute through genetic and agronomical approaches	K. N. Chourasia	2020-2025
4.	In vitro regeneration and haploidy induction in jute	S. Datta	2022-2027
5.	Molecular mapping for stem rot resistance in jute	K. Meena	2022-2027
6.	Pre-breeding and breeding approaches for developing major biotic stress resistance in jute	J. K. Meena	2021-2026
7.	Introgression of low pectin content into high-yielding jute varieties	J. K. Meena	2020-2025
8.	Genetic enhancement of fibre quality traits in tossa jute (*Corchorus olitorius*)	Thribhuvan R	2021-2026
9.	Maximization of seed yield of sunnhemp in Gangetic alluvial Zone	A. Bera	2024-2027
Crop Production			
10.	Assessing the role of microbes in jute from seed to fibre	Lavanya, A. K.	2021-2025
11.	Leaf litter management: decomposition and nutrient dynamics of leaf litter composts and its effects on JAF crops	A. K. Singh	2020-2025
12.	Standardization of organic and natural agricultural practices for jute-based agro-ecosystem	S. P. Mazumdar	2022-2026
13.	Precision irrigation scheduling for augmenting yield, resource-use efficiency and water productivity in jute-based cropping systems	S. Ghosh	2022-2025
14.	Water management strategies for profitable and sustainable jute cultivation under rainfed and irrigated ecosystems	D. Datta	2022-2025
15.	Farm mechanization for efficient sowing and fibre extraction for jute and allied fibre	R. K. Naik	2022-2025
16.	Effect of planting materials and fertilizer levels on growth and yield of sisal (*Agave sisalana*) and hybrid sisal	S. Sarkar	2018-2024
17.	Analysis of yield gap and contribution of production factors in cultivation of jute	S. K. Jha	2020-2025
Crop Protection			
18.	Identification of donor lines for resistance against stem rot and anthracnose diseases in jute	S.K. Sarkar	2021-2025
19.	Development of IPM module in mesta	R. K. De	2021-2025
20.	Monitoring and assessment of insecticide resistance against stem rot and anthracnose diseases in jute	V. Ramesh Babu	2023-2026
21.	Minimizing yield gap and maximizing the income of jute-based farm families through cluster-based approach-a case study	M. L. Roy	2022-2025
AINP-JAF			
22.	Expansion of Flax Area in Pilot Scale with Improved Technologies	S Mitra	2020-2025
23.	Risk assessment through modelling of major pests and diseases of jute under climate change scenario in India	N. M. Alam	2020-2025

Weather Report 2024

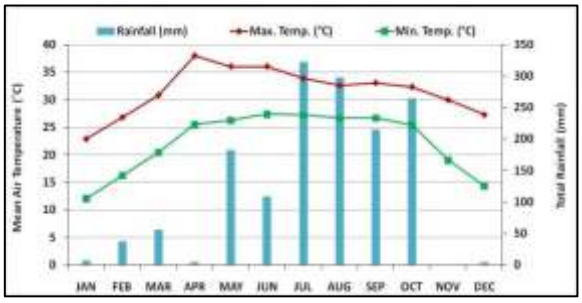
ICAR-CRIJAF, Barrackpore (West Bengal)

Total annual rainfall:	1812.5 mm
Annual mean maximum air temperatures:	31.1 °C
Annual mean minimum air temperatures:	20.7 °C
Hottest Month: April	37.6 °C
Coldest Month: December	10.3 °C
The highest monthly total rainfall: August	571.4 mm
The lowest monthly total rainfall: November	1.3 mm
No rainfall in months:	Nil



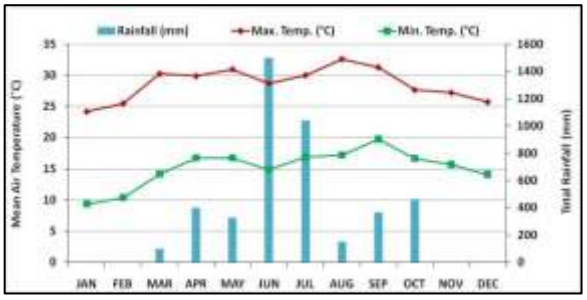
CSRFJAF, Budbud (West Bengal)

Total annual rainfall:	1499.8 mm
Annual mean maximum air temperatures:	31.6 °C
Annual mean minimum air temperatures:	22.3 °C
Hottest Month: April	38.0 °C
Coldest Month: January	12.0 °C
The highest monthly total rainfall: July	322.6 mm
The lowest monthly total rainfall: April	4.2 mm
No rainfall in months: Nov	



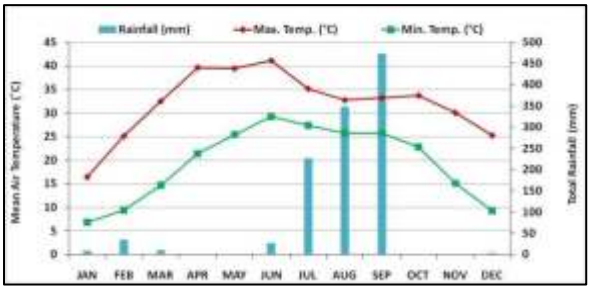
RRS, Sorbhog (Assam)

Total annual rainfall:	4348.2 mm
Annual mean maximum air temperatures:	28.7°C
Annual mean minimum air temperatures:	15.2°C
Hottest Month: August	32.6°C
Coldest Month: January	9.4°C
The highest monthly total rainfall: June	1499.0 mm
The lowest monthly total rainfall: March	102.0 mm
No rainfall in months: Jan, Feb, Nov, Dec.	



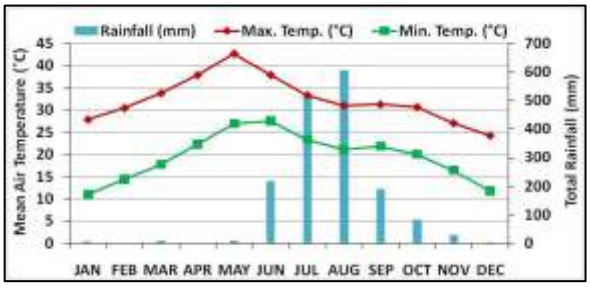
ShRS, Pratapgarh (Uttar Pradesh)

Total annual rainfall:	1133.6 mm
Annual mean maximum air temperatures:	32.0 °C
Annual mean minimum air temperatures:	19.4 °C
Hottest Month: June	41.1 °C
Coldest Month: January	6.8 °C
The highest monthly total rainfall: September	473.0 mm
The lowest monthly total rainfall: December	3.4 mm
No rainfall in months: Apr, May, Oct, Nov	



SRS, Bamra (Odisha)

Total annual rainfall:	1664.6 mm
Annual mean maximum air temperatures:	32.4 °C
Annual mean minimum air temperatures:	19.6 °C
Hottest Month:May	42.7 °C
Coldest Month: January	11.0 °C
The highest monthly total rainfall: August	604.6 °C
The lowest monthly total rainfall: December	3.0 mm
No rainfall in months: Feb, Apr.	



Source: Agrometeorology Units, ICAR-CRIJAF H.Q. and Regional Stations

PEOPLE @ICAR-CRIJAF

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Sri Lochindra	Sri Jokhu	Sri Shyamal Bhanja	Sri Mahesh Singh Verma
Sri Sugriva	Sri Jagdish Singh	Sri Anup Das	Sri Bhuwal Pal

Note: This is not purported to be a seniority list.

PERSONNEL, TRANSFERS, NEW JOINING, SUPERANNUATION, PROMOTIONS

1. Transfer from ICAR-CRIJAF, Barrackpore during Jan-Dec 2024

Name of the Person	Designation	Date (w.e.f.)
Mrs. Pallavi Mandal	Sr. Technical Assistant	Transferred to ICAR-NBSSLUP, Kolkata on 28.08.2024 (A/N)
Sri Ashish Madan Pitre	Sr. Technical Assistant	Transferred to ICAR-CCARI, Old Goa, on 30.10.2024 (A/N)
Sri Sanjay Kumar Sethi	Technical Assistant	Transferred to ICAR-NRRI, Cuttack on 08.11.2024 (A/N)

2. Transfer to ICAR-CRIJAF, Barrackpore during Jan-Dec 2024

Name of the Person	Designation	Date (w.e.f.)
Dr. Krishna Gopal Mandal	Pr. Scientist	01.11.2024 (F/N) from ICAR-MGIFRI, Motihari, Bihar

3. Superannuation / Termination / VRS of ICAR-CRIJAF, Barrackpore during Jan-Dec 2024

Name of the Person	Designation	Date (w.e.f.)
Dr. C. Chattopadhyay	Pr. Scientist	31.10.2024 (A/N)
Sri L N. Ghosh	Technical Officer	31.01.2024 (A/N)
Sri Ram Asre Yadav	SSS	31.01.2024 (A/N)
Sri Paras Nath Pal	Assistant	31.01.2024 (A/N)
Sri K.P. Debnath	Technical Officer	31.10.2024 (A/N)
Sri Prabin Boro	SSS	30.11.2024 (A/N)
Kum. Koushalya	SSS	31.12.2024 (A/N)
Sri Pabitra Das	SSS	31.12.2024 (A/N)
Dr. Jyoti Bohra	SMS (Home Sci.)	Resigned on 24.10.2024 (A/N)
Sri Ravi Shankar Kumar	Technician/T-1	Resigned on 13.08.2024 (A/N)
Sri Mukesh Kr. Gautam	Technician/T_1	Resigned on 19.05.2024 (A/N)

4. NEW JOINING AT ICAR-CRIJAF, BARRACKPORE DURING JAN- DEC 2024

Name of the Person	Designation	Date (w.e.f.)
Mr. Divte P. Raghunath	Scientist	21.07.2023
Mr. Palash Tiwari	Finance & Accounts Officer	20.03.2024
Dr. Aravind T.	SMS (Plant Protection)	12.06.2024 joined at KVK, North 24 Parganas
Mr. Syam K.R.	SMS (Fishery Sci.)	14.06.2024 joined at KVK, North 24 Parganas
Mr. V. Om Subham Raju	SMS (Agronomy)	28.06.2024 joined at KVK, North 24 Parganas
Ms. D. Bernice Ekhe	SMS (Home Sci.)	22.11.2024 joined at KVK, North 24 Parganas
Dr. Vinod Kumar	SMS (Agril. Extension)	10.06.2024 joined at KVK, Bud Bud, Burdwan
Mr. Sourav Bhadra	SMs (Fishery Sci.)	10.06.2024 joined at KVK, Bud Bud, Burdwan
Dr. Mamidala Lavanya	SMS (Animal Sci.)	19.06.2024 joined at KVK, Bud Bud, Burdwan
Dr. Jyoti Bohra	SMS (Home Sci.)	19.06.2024 joined at KVK, Bud Bud, Burdwan
Sri Abhishek Anand	Assistant	29.08.2024
Sri Sayan Basu	Assistant	02.09.2024 joined at KVK, North 24 Parganas
Sri Sandip Kannagi	Assistant	06.09.2024
Sri Sankalp Singh	Assistant	25.09.2024
Sri Pawan Kumar	UDC (on Deputation)	10.06.2024
Sri Arghadip das	Technician/T-1	02.05.2024
Sri. Subhasis Patra	Technician/T-1	02.05.2024
Ms. Nishi Kumari	Technician/T-1	02.05.2024
Sri Prasit Mukherjee	Technician/T-1	02.05.2024
Sri Badhan Sarkar	Technician/T-1	02.05.2024
Sri Deepak Kumar	Technician/T-1	02.05.2024
Sri Shivam Kumar	Technician/T-1	02.05.2024
Sri Mrityunjoy Sow	Technician/T-1	02.05.2024
Sri Partha Biswas	Technician/T-1	02.05.2024
Sri Newton Hazra	Technician/T-1	02.05.2024
Sri Raja Kumar Sharma	Technician/T-1	02.05.2024

Sri Rakesh Raushan Kumar	Technician/T-1	03.05.2024
Sri Anshu Kumar	Technician/T-1	03.05.2024
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Sri Prakash Kumar	Technician/T-1	06.05.2024
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Sri Deepak Prasad	Technician/T-1	07.05.2024
Sri Pijush Das	Technician/T-1	08.05.2024
Ms. Pallavi Banarji	Technician/T-1	09.05.2024
Sri Sourav Medya	Technician/T-1	22.08.2024
Sri Ravi Shankar Kumar	Technician/T-1	02.05.2024
Sri Mukesh Kumar Gautam	Technician/T-1	09.05.2024

5. Promotions during the Year 2024

Name of the Person	Designation	Promoted to (Date)
Dr. Dhananjay Barman	Sr. Scientist	Pr. Scientist RGP Rs.10000/-/Level-14 w.e.f. 07.01.2023
Dr. Amit Bera	Sr. Scientist	Pr. Scientist RGP Rs.10000/-/Level-14 w.e.f. 08.01.2023
Dr. Kumar Nishant Chourasia	Scientist	Scientist RGP Rs.7000/-/Level-11 w.e.f. 02.07.2022
Dr. Jitendra Kumar Meena	Scientist	Scientist RGP Rs.7000/-/Level-11 w.e.f. 04.01.2023
Mrs. Anindita Pal	Technical Assistant	STA w.e.f. 24.10.2023
Sri Sandip Roy	Technical Assistant	STA w.e.f. 10.12.2023
Mrs. Pallavi Mandal	Technical Assistant	STA w.e.f. 18.12.2023
Sri Kallol Sarkar	Technical Assistant	STA w.e.f. 29.12.2023
Sri Raktim Mitra	Technical Assistant	STA w.e.f. 22.12.2023
Sri Ashish Madan Pitre	Technical Assistant	STA w.e.f. 31.12.2023
Sri Sudip Nandy	Technical Assistant	STA w.e.f. 11.02.2024
Sri Vinay Kumar Singh	Sr. Technician	TA w.e.f. 02.01.2023
Sri Biswajit Biswas	Technician	Sr. Tech. w.e.f. 22.12.2023
Ms. Sharmila Sarkar	Technician	Sr. Tech. w.e.f. 24.12.2023
Sri Sanjay Kumar	Technician	Sr. Tech. w.e.f. 26.12.2023
Sri Paritosh Roy	Technician	Sr. Tech. w.e.f. 29.12.2023
Sri Ram Nivas Kumar	Technician	Sr. Tech. w.e.f. 03.01.2024
Sri Arko Banerjee	Technician	Sr. Tech. w.e.f. 11.01.2024
Sri Ankan Singha Roy	Technician	Sr. Tech. w.e.f. 13.02.2024
Sri Kamal Kumar Banik	Sr. Technician	TA w.e.f. 14.05.2024

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