

ICAR - CRIJAF



A PROFILE



ICAR-Central Research Institute for Jute and Allied Fibres

ISO 9000 : 2015 Certified Institute

Barrackpore, Kolkata 700121, West Bengal

www.crijaf.icar.gov.in

January 2021

ICAR- CRIJAF : A Profile

भा.कृ.अनु.प. -केन्द्रीय पटसन एवं समवर्गीय रेशा अनुसंधान संस्थान
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Compiled and Edited by:

S.K. Sarkar, S.K. Jha, Gouranga Kar, S. Satpathy, Jiban Mitra, A.R. Saha and S. Mitra

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Dr. Gouranga Kar,
Director,

ICAR-Central Research Institute for Jute and Allied Fibres, Nilganj, Barrackpore

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FOREWORD



The ICAR-Central Research Institute for Jute and Allied Fibres (CRIJAF), Barrackpore, a premier crop research institute of the Indian Council of Agricultural Research (ICAR) under Department of Agricultural Research and Education (DARE), Ministry of Agriculture, GoI is mandated to develop technologies to improve yield and quality of jute and allied fibres. It remains vigilant and responsive to changing scenario through development of novel technologies and by promoting problem-solving

knowledge products in this sector. The multi-disciplinary scientific team of the Institute is dedicatedly working now towards development of highly productive varieties with high quality fibre which can meet the need to make high value diversified products and focusing on many other aspects beyond the traditional use of fibre, rather emphasizing the pharmaceutical, nutraceutical, diversified commercial uses. Sisal and jute fibre with greater strength and durability are the potential raw materials for the manufacturing of cordage, geo-textiles and industrial fabrics. Some of the recent measures of Government of India like the Compulsory Packaging Act, policy to ban on 'single use plastics', announcement of revised minimum support price of jute every year will definitely give a fillip to the development of jute sector. Integrated technology support for Jute and Allied Fibre farming coupled with sensitization through skill development for making of jute diversified products and handicrafts among stakeholders especially the farm women will lead to economic empowerment. Consumer awareness towards greater use of biodegradable products linked to Government's Clean India initiatives "Swachha Bharat Programme" will sustain the market demand for jute-based products. I am confident that R & D efforts of ICAR-CRIJAF will lead towards inclusive growth of the stakeholders linked to jute and allied fibre sector and will continue to support millions of farm families for their livelihood besides mitigating impacts of climate change.

I am highly thankful to Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR, New Delhi for his constant guidance. I express my sincere gratitude and thanks to Dr. T. R. Sharma, Deputy Director General (Crop Science) and Dr. R. K. Singh (Assistant Director General (Commercial Crops) for their encouragement and support in bringing out this publication.



Place : Barrackpore
Date : 06-01-2021

(GOURANGA KAR)
Director, ICAR-CRIJAF



History of jute research in India and establishment of ICAR-CRIJAF

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 at the present location at Nilganj, Barrackpore in 1953 as Jute Agricultural Research Institute (JARI). ICJC was taken over by Indian Council of Agricultural Research (ICAR) in 1966. The Institute was renamed as Central Research Institute for Jute and Allied Fibres (CRIJAF) in 1990. To carry out research on allied fibres and seed, 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 State Agricultural University based and six ICAR institute based collaborating centers for multi-locational testing and validation of the 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 2017 at Burdwan and 24 Parganas (N) district of West Bengal, respectively.

Vision, Mission, Mandate of ICAR-CRIJAF

VISION: Provide leadership in research and technology development to make jute and allied fibre farming profitable and sustainable

MISSION: To explore traditional and new frontier areas of science for technology development, promotion and policy guidance for a vibrant, productive and resilient jute and allied fibre agriculture.

MANDATE:

- Basic and strategic research on improvement of jute and allied fibre crops, 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.

RESEARCH, DEVELOPMENT AND OUTREACH UNITS OF ICAR-CRIJAF

- ❖ **Division and Sections:** To carry out research on various aspects of jute and allied fibres as well as transfer of technologies the institute has three divisions namely Crop Improvement, Crop Production and Crop Protection. Two sections namely Agricultural Extension and All India Network Projects (AINP) on Jute and Allied Fibres are also supporting Research & Development work of the Institute.
- ❖ **Regional Research Stations:** To carry out research on Jute and allied fibres and seed, 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).
- ❖ **All India Network Projects (AINP :** Besides, the Institute has nine (9) SAU based and six (6) ICAR institute based collaborating centers for multi-locational testing and validation of the technologies under All India Network Projects on Jute and Allied Fibres (AINP on JAF).
- ❖ **Krishi Vigyan Kendra:** Two KVKs under the administrative control of ICAR-CRIJAF was established in 2006 and 2017 to cater the need of Burdwan and 24 Parganas (N) districts of West Bengal, respectively.



CSRSJAF, BudBud



Sunnhemp Research Station, Pratapgarh



Sisal Research Station, Bamra



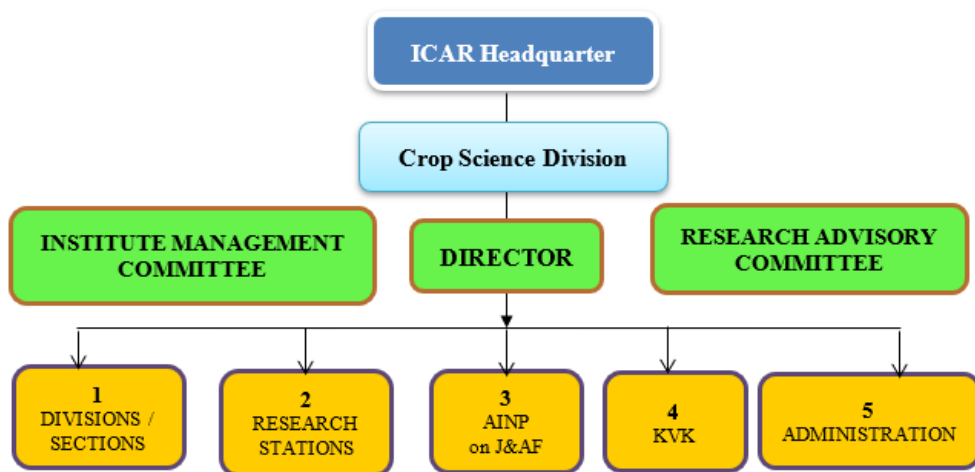
Ramie Research Station, Sorbhog

- ❖ The institute has 3 research farms in the name of eminent jute scientists viz., J.S. Patel farm, B.C. Kundu farm, T. Ghosh farm where on-station field experiments are being conducted. For conducting online meeting, conferences, the institute has well established Agricultural Knowledge Management Unit (AKMU). The institute has well established crop production, crop improvement and crop protection laboratories. It has also Extension Section for organizing training and Front line demonstration (FLD) of different proven technologies of the institute. The institute has established a jute and allied fibre museum where different grades of natural fibres and diversified products have been showcased.



Jute and allied fibre crop museum with fibre quality and diversified products

ICAR-CRIJAF Organizational Setup



SIGNIFICANT CONTRIBUTIONS:

The ICAR-CRIJAF plays an important role in the country to provide technology backstopping, research and development support to its six mandated crops like jute, mesta (kenaf and roselle), flax, sisal, ramie and sunnhemp.

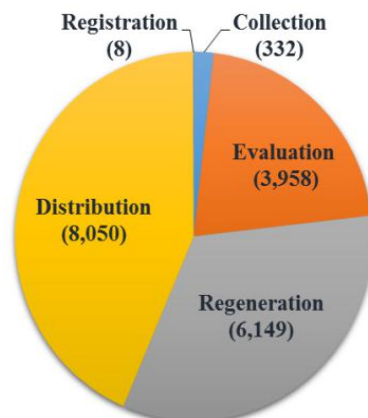
1. Maintenance of Plant Genetic Resources and Development of Varieties of Jute and Allied Fibres

A. Plant genetic resource activities

ICAR-CRIJAF is the National Active Germplasm Site (NAGS) for jute and allied fibre crops in India. Collection, characterization, evaluation, conservation and utilization of jute and allied fibre germplasm are continuous activities of NAGS. Trait specific germplasm lines are utilized in the breeding programme to develop high yielding varieties of for jute and allied fibre crops.

Status of germplasm collection in ICAR-CRIJAF gene bank till date

Crop	No. of accessions
Tossa jute (<i>Corchorus olitorius</i>)	1770
White jute (<i>Corchorus capsularis</i>)	965
Wild jute	498
Kenaf (<i>Hibiscus cannabinus</i>)	770
Roselle (<i>Hibiscus sabdariffa</i>)	988
Wild mesta	124
Sunnhemp (<i>Crotalaria juncea</i>)	197
Wild sunnhemp	114
Flax (<i>Linum usitatissimum</i>)	127
Ramie (<i>Boehmeria nivea</i>)	180
Sisal (<i>Agave spp.</i>)	76
Total	5809



Gene Bank at ICAR-CRIJAF

B. Seeds of ICAR-CRIJAF varieties dominate jute sector in India and abroad

Jute is a bio-degradable, eco-friendly, versatile natural fibre, cultivated in India in about 7.5 lakh hectare and source of livelihood of about 4 million farm families, provides direct employment to about 3.7 lakh workers. Being the largest producer of raw jute in the world, India today earns about Rs 2200 crores per annum through export of jute goods. Due to environmental degradation with plastics/synthetics, jute based diversified products like jute office bag, folder, decorative items, carry bags, etc. are in great demand in addition to traditional use like sacs, twines etc. ICAR-CRIJAF, Barrackpore takes a lead role in providing technology backstopping and facilitates to take policy decisions on jute and allied fibre production at the national level. ICAR-CRIJAF is the only institute in India which undertakes research and development on jute and allied fibre crops and the institute is the sole producer and supplier of almost 99% breeder seed of jute and mesta in India. Presently, 5000 metric tonne (MT) of certified seeds are required to cover around 7.5 lakh ha area of the country, 95% of which is met from ICAR-CRIJAF developed varieties. The spread of ICAR- CRIJAF developed varieties are not only restricted in India but also neighbouring countries like Bangladesh (> 95%), Nepal (100%), Thailand, Myanmar and Malaysia. About 4000 MT of ICAR-CRIJAF developed variety (var.JRO 524) is exported to Bangladesh every year.

C. High yielding varieties of jute and allied fibre crops developed by ICAR-CRIJAF

ICAR-CRIJAF is the nodal organization for the crop improvement programme of jute and allied fibre crops in the country and the institute successfully incorporated the desirable traits in the new varieties. A number of short duration, high yielding and premature flowering resistant Olitorius varieties (Tossa jute) were developed which replaced about 90% of *C. capsularis* varieties (White jute) area and increased the fibre yield (national average) from 11 q/ha (1960s) to 27 q/ha. Similarly, the ruling varieties of flax, ramie and sunnhemp have been developed by the institute. Some important and popular varieties of jute and allied fibres along with their potential yield and special characteristics are mentioned below

I. Tossa jute varieties

Variety	Recommended Area	Potential yield and other special characters
JRO-204 (SUREN)	As the variety is highly resistant to premature flowering, it can be sown from first week of March and can easily be accommodated in multiple cropping systems in Assam, Bihar, Orissa and West Bengal.	The yield potential of the variety is 40 q/ha. It also produces finer quality fibre (2.3-2.4 tex). The fibre strength of this variety is 27.10 g/tex. Its fibre is free from body defects and root contents, which fetches higher selling price due to improved ISI grade.

Variety	Recommended Area	Potential yield and other special characters
JBO-2003-H (IRA)	Recommended for entire <i>Tossa</i> jute growing belt of the country for cultivation during mid March to last week of April	The yield potential of the variety in farmers' field is 35 q/ha. The variety showed better resistance to biotic stress and also had less defect and root content as compared to national checks.
S-19 (SUBALA)	Recommended for West Bengal, Assam, Bihar and Orissa for last week of March to end of April sowing.	It has yield potential up to 30 q/ ha, fibre quality grade is TD2, tolerant to stem rot, root rot and anthracnose, susceptible to yellow mite, moderately tolerant to semilooper and stem weevil.
JROG 1 (RITHIKA)	Recommended for entire <i>tossa</i> jute growing states for mid-March to end- April sowing.	The yield potential is 40 q/ha. Resistance to premature flowering, fibre quality is good, tolerant to abiotic stresses, resistance to root rot and stem rot disease.
JRO 2407 (SAMAPTI)	Suitable for entire <i>tossa</i> jute growing regions especially, West Bengal, Assam, Bihar and Odisha states for early March sowing. High humid areas having alternate rain and sunshine is the ideal growth condition for this variety	A high yielding deep red stem coloured variety of <i>tossa</i> jute with average yield 33.82 q/ha. It has pre-mature flowering resistance attribute. Drought resistance at early stage of growth and can tolerate water logging at later stage of crop growth.
CO-58 (SOURAV)	Suitable for medium and high land in rainfed situation and areas where jute is followed by transplanted aman paddy.	It has the yield potential of 30 q/ha. Pod non shattering type, resistant to premature flowering, better fibre quality, resistance to major pest and diseases. Suitable for <i>tossa</i> jute growing regions of India.
JROM 1 (PRADIP)	Recommended for all the <i>tossa</i> jute growing states <i>viz.</i> , West Bengal, Odisha, Bihar and Assam.	The fibre yield potential of the variety is 35.0 q/ha. It is resistant to major pests and diseases (stem rot, root rot and semilooper, Bihar hairy caterpillar and yellow mite).
JROMU 1	Suitable for entire <i>tossa</i> jute growing regions especially, West Bengal, Assam, Bihar and Odisha states for late March to mid-April sowing.	Green stem with pre-mature flowering resistant high yielding variety with average yield potential 32.89 q/ha. Fairly good fibre strength (20.80 g/tex) and fine fibre (2.90 tex) quality.

Variety	Recommended Area	Potential yield and other special characters
JRO 524 (NAVIN)	Suitable for entire tossa jute growing regions especially, West Bengal, Assam, Bihar and Odisha. Currently this variety is being exported to Bangladesh.	The fibre yield potential is 40 q/ha but has coarse fibres. Pods non-shattering, sowing during middle of March does not induce premature flowering. It is least susceptible to yellow mite pest and resistant to root rot diseases in high rainfall areas.

II. White jute varieties

Variety	Recommended Area	Potential yield and other special characters
KJC 7 (SHRESTHA)	Suitable for the white (<i>Capsularis</i>) jute growing areas of the Indian jute belt in the medium lands especially suited for Odisha, Uttar Pradesh and Assam	Premature flowering resistance, height 285-300 cm, non-shattering type pod and chocolate brown seed, suitable for early March to early April sowing and average fibre yield 28- 30 q/ha. Its potential yield is 35 q/ha
JRC 9057 (ISHANI)	Adapted to entire jute growing areas especially, West Bengal, Assam, Bihar and Odisha for March to end of April sowing. Highly suitable for the prevalent cropping sequence of jute followed by transplanted Aman paddy.	The fibre yield potential is 36 q / ha. Green stem with light red pigmentation and average plant height is 3.35 metre. Fibre fineness (1.31 tex). Highly tolerant to stem rot and jute semi looper.
JRC 517 (SIDDHARTHA)	The variety is suitable for mid March to mid April sowing in the entire <i>capsularis</i> jute growing belt.	The fibre yield potential is 30 q/ha under rainfed situation and the fibre is of good quality. The pods are non-shattering type. The variety is drought tolerant during the early stage of growth and can also withstand water logging in the later stage.

Variety	Recommended Area	Potential yield and other special characters
JRC 532 (SASHI)	This variety is suitable for sowing in mid March to mid April in the entire <i>capsularis</i> jute growing belt.	The fibre yield potential is 30 q/ha under rainfed situation. The pods are non-shattering type, drought tolerant during the early stage of growth and can also withstand water logging in the later stage.
JRCM 2 (PARTHO)	Recommended for for all the <i>white</i> jute growing states viz., West Bengal, Uttar Pradesh, Odisha, Bihar and Assam.	The fibre yield potential is 32 q/ha. Resistant to major pests and diseases including stem and root rot, yellow mite, stem weevil and hairy caterpillar.

III. Kenaf varieties

Variety	Recommended Area	Potential yield and other special characters
JRKM 91 (SATYEN)	Recommended for traditional mesta growing belt of the country for Mid-April to last week of May sowing under mid and highland rainfed situation.	The fibre yield potential is 36 q/ha with very fine (2.54 tex) fibre quality and less defective fibre. Green stem with palmate leaf shaped variety highly resistant to foot and stem rot disease.
Central Kenaf JBMP 2	JBMP-2 is mainly suitable for rainfed agro-ecosystem of Andhra Pradesh, Odisha, West Bengal, Bihar and North-Eastern states for April to last week of May sowing	The fibre yield potential is 36 q/ha with stronger (22.25 g/tex) fibre. Stem cylindrical with less bristles and green in colour. Tolerant to major diseases and pests (mesta mealy bug)
JBMP 3 (PRIYA)	Suitable for cultivation in Odisha, Maharashtra, Andhra Pradesh, Bihar and North Eastern states	The fibre yield potential is 37 q/ha with stronger (23.24 g/tex) & finer (3.08 tex) fibre quality. Green stem & un-lobbed leaf, less root content and defects. Tolerant to YVM and stem rot
JBMP 4 (UTKARSH)	Recommended for growing in West Bengal, Odisha, Bihar, Andhra Pradesh Maharashtra, Assam and Tripura	The fibre yield potential is 37 q/ha with stronger (22.78 g/tex) and finer (3.39 tex) fibre quality. Green stem & lobbed leaf, less root content and defects. Tolerant to mealybug, spiral borer, YVM and stem rot..



Variety	Recommended Area	Potential yield and other special characters
Centra Kenaf JRHC 3	Suitable for cultivation in rainfed and irrigated agro eco-system of mesta growing states viz. West Bengal, Odisha, A.P., Maharashtra, Bihar and North Eastern Hill region	Coppery red pigmented, deeply lobbed variety with average fibre yield 30 q/ha. Good fibre quality in terms of fibre tenacity (20.60 g/tex) and finer fibre (3.30 tex)

IV. Roselle varieties

Variety	Recommended Area	Potential yield and other special characters
CRIJAFR-5 (Central Roselle RATNA)	Suitable for mid and high land irrigated / rainfed agro ecological region of mesta growing states especially, Andhra Pradesh, Tamilnadu, Odisha and West Bengal.	The fibre yield potential is 38 q/ha. Moderately bristled red stem variety with very fine (2.69 tex) fibre quality and less root content. Tolerant to major diseases and pests.
JRR 17 (AYUSH)	Adapted to mesta growing states; Andhra Pradesh, Bihar, Odisha, Maharashtra, West Bengal and North Eastern states especially Tripura	The fibre yield potential is 35 q/ha. Less bristled green stem variety with better fibre quality with less root content and defects and stronger (20.2 g/tex) and finer (2.98 tex) fibre quality.
CRIJAF R-2 (ROSELLE VARDAN)	The variety is adapted to rainfed agro-ecosystem of all mesta growing states namely Andhra Pradesh, Odisha, West Bengal, Bihar and North-Eastern states.	The potential yield is 32-35 q/ha while the average yield of the variety is 25 q/ha and it possesses finer fibre (2.43 tex) and have higher resistance to insects (aphids, mealy bug, and foot and stem rot disease).
CRIJAF R-8 (ROSELLE SAMPURNA)	The variety is adapted to rainfed agro-ecosystem of all mesta growing states namely Andhra Pradesh, Odisha, West Bengal, Bihar and North-Eastern states	The potential yield is 32-35 q/ha while the average yield of the variety is 27 q/ha and it possesses finer fibre (2.51 tex) and have higher resistance to insects (aphids, mealy bug, and foot and stem rot disease).
JRHS 1	Recommended for growing in West Bengal Bihar, Odisha, Maharashtra, Andhra Pradesh, and Tamil Nadu	Red pigmented stem variety with average yield 27 q/ha. Better fibre quality in terms of fibre fineness (3.0 tex) and tolerant to foot and stem rot.

V. Sunnhemp varieties

Variety	Recommended Area	Potential yield and other special characters
JRJ 610 (Prankur)	Recommended for growing in Uttar Pradesh, Bihar, Madhya Pradesh, Chhatisgarh, W.B., Odisha, Tamil Nadu and Maharashtra.	The fibre yield potential is 15 q/ha with better fibre quality (13.19 g/tex) and tenacity. Resistance to vascular wilt.
SUIN 03 (Kavita)	Recommended for growing in Uttar Pradesh, Bihar, Madhya Pradesh, Chhatisgarh, W.B., Odisha, Tamil Nadu and Maharashtra.	The fibre yield potential is 15 q/ha with better fibre tenacity (16.4 g/tex) and tolerant to vascular wilt.

VI. Flax variety

Variety	Recommended Area	Potential yield and other special characters
JRF 2 (Tiara)	The first fibre flax variety in the country released for cultivation in J&K, Himanchal Pradesh, U.P., North Bengal and North Eastern Hill region.	The fibre yield potential is 16 q/ha with high fibre strength (25.55 g/tex) and field tolerant to major diseases like <i>Fusarium</i> wilt and <i>Alternaria lini</i> .

VII. Ramie variety

Variety	Recommended Area	Potential yield and other special characters
R 1411 (Hazarika)	North Eastern States of India and Northern part of West Bengal	The fibre yield potential is 16 q/ha, fibre tenacity-22.34 g/tex. Moderately resistant to Indian red admiral caterpillar and leaf folder.



Tossa jute: JRO 204 (Suren)



Tossa jute: JRO-2407



Tossa jute: JBO-2003-H (Ira)



Tossa jute: S 19



Tossa jute: JROMU-1



Tossa jute: JRO 524



White jute: JRC 517
(Siddhartha):



White jute: JRCM 2 (Partho)



White jute: JRC 9057 (Ishani)



Kenaf: JRKM-9-1 (Satyen)



Kenaf: Central Kenaf JBMP 2



Kenaf : JBMP 3 (Priya)



Kenaf: JBMP 4 (Utkarsh)



**Roselle : CRIJAFR 8
(Roselle Sampurna)**



**Roselle : Central Roselle CRI-
JAF R 5**



Roselle: JRR - 17 (Ayush)



Sunnhemp: JRJ 610



Sunnhemp: SUIN 3



Flax variety: JRF 2 (Tiara)



Ramie : R 1411 (Hazarika)



Sisal : Bamra Hybrid 1

C. Jute biotechnology

1. Sequencing of Jute Genome

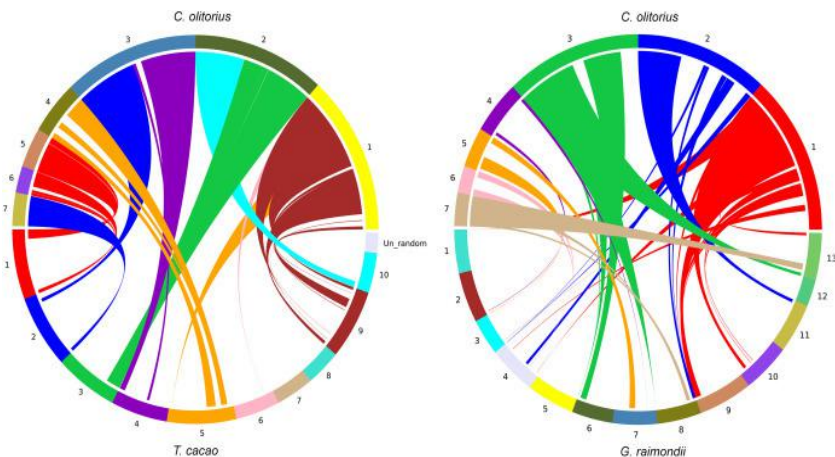
The genome of leading dark jute (*Corchorus olitorius*) variety JRO-524 (Navin) was sequenced in collaboration with ICAR-NIPB. The 377.3 Mbp genome contains 57,087 protein-coding genes with a large number of (1765) disease resistance-like and defense response genes. This would provide new insights that could help understand the bast fibre biogenesis, mechanisms of photoperiodic control of flowering and responses to several stresses in jute to help breeding of high-yielding jute varieties.

2. Jute Marker Database

A database of a large number of molecular markers including simple sequence repeats (SSRs), intron and transposable element-derived markers were developed for the easy access of jute breeders, researchers, and students. These markers were developed from the published genomic resources of Jute and can be used for genetic diversity estimation of jute germplasm, marker-assisted breeding, tagging of important traits, and genetic characterizations of jute and related bast fibre plants.

3. Population Genetic Analysis of Jute

Individual-based restriction site-associated DNA sequencing (RADseq) of a dark jute (*C. olitorius*) association mapping population was performed. The population was comprised of Indian and exotic fibre-type cultivars, landraces, improved lines and varieties collected from 15 countries. The RAD analysis was able to conclusively distinguish between Indian and African populations, and demonstrated that bast fibre production was an artificial, while abiotic and biotic stresses were natural selection pressures in *C. olitorius* adaptation.



2. Development of viable agro-technology for crop production

A. Recommended crop production packages

	CROPS		
	JUTE	KENAF	ROSELLE
Area of cultivation	<ul style="list-style-type: none"> West Bengal, Bihar, Assam, Odisha, Meghalaya, Tripura, Jharkhand, U.P, Nagaland 	<ul style="list-style-type: none"> Andhra Pradesh, West Bengal, Bihar, Assam, Odisha, Tripura, Mizoram, M.P., Maharastra, Karnatka 	<ul style="list-style-type: none"> Andhra Pradesh, West Bengal, Bihar, Assam, Odisha, Tripura, Mizoram, M.P., Maharastra, Karnatka
Climate prevails in the growing areas	Temperature: <ul style="list-style-type: none"> Tmax -32-36 °C Tmin - 24.0-26.0°C RH: 50-94% Rainfall during cropping season: 800-1000 mm 	Temperature: <ul style="list-style-type: none"> Tmax -32-36 °C Tmin - 24.0-26.0°C RH: 50-94% Rainfall during cropping season: 1030 mm 	Temperature: <ul style="list-style-type: none"> Tmax -32-36 °C Tmin - 24.0-26.0°C RH: 50-94% Rainfall during cropping season: 1030 mm
Soil	<ul style="list-style-type: none"> Loamy alluvial soil with pH 5.0-7.4 	<ul style="list-style-type: none"> Sandy loam with good quantity of organic matter 	<ul style="list-style-type: none"> Sandy loam with good quantity of organic matter
Varieties	<ul style="list-style-type: none"> Tossa Jute: JRO 204, JRO 524, JBO 2003-H, JRO 128 White Jute: JRC 532, JRC 517 	<ul style="list-style-type: none"> JRKM-9-1, JBM 81, JBMP 2, JBMP 3, MT-150 (for paper pulp) 	<ul style="list-style-type: none"> CRIJAF-R-8, CRIJAF-R-5 AMV 7, JRHS -1
Sowing time	<ul style="list-style-type: none"> 25th March - 30th April (based on climatic condition) 	<ul style="list-style-type: none"> May - June (1st week) 	<ul style="list-style-type: none"> May - June
Sowing method	<ul style="list-style-type: none"> Line sowing by CRIJAF Multi-row seed drill 	<ul style="list-style-type: none"> Line sowing 	<ul style="list-style-type: none"> Line sowing
Spacing	<ul style="list-style-type: none"> Plant to plant : 5-7 cm Row to row: 25-30 cm 	<ul style="list-style-type: none"> Plant to plant : 7-10 cm Row to row: 30 cm 	<ul style="list-style-type: none"> Plant to plant : 7-10 cm Row to row: 30 cm
Seed Rate	<ul style="list-style-type: none"> Line sowing : 3-4 kg/ha (tossa jute) Line sowing : 4-5 kg/ha (white jute) 	<ul style="list-style-type: none"> 12-14 kg/ha 	<ul style="list-style-type: none"> 10-12 kg/ha



	CROPS		
	JUTE	KENAF	ROSELLE
Nutrient management	<ul style="list-style-type: none"> • FYM @ 10-12 t/ha • NPK@ 60:30:30 kg/ha (rainfed) • NPK@ 80:40:40 kg/ha (irrigated) 	<ul style="list-style-type: none"> • FYM @10-12 t/ha and NPK@60:30:30 kg/ha 	<ul style="list-style-type: none"> • FYM @10-12 t/ha and NPK@60:30:30 kg/ha
Weed Management	<ul style="list-style-type: none"> • Operate CRIJAF Nail Weeder/ Single wheel jute weeder at 7-8 DAS and scrapper at 21 DAS followed by need based hand weeding • Pre-emergence herbicide: Spray Pretilachlor 50EC @3ml/L at 48hrs after sowing with irrigation • Post-emergence herbicide: Spray Quizalofop Ethyl 5EC @1.5-2ml/l + adhesive 2ml/L at 15-20 DAS 	<ul style="list-style-type: none"> • Operate CRIJAF Nail Weeder/ Single wheel jute weeder at 7-8 DAS and scrapper at 21 DAS followed by need based hand weeding • Pre-emergence herbicide: Spray Pretilachlor 50EC @3ml/L at 48hrs after sowing with irrigation • Post-emergence herbicide: Spray Quizalofop Ethyl 5EC @1.5-2ml/l + adhesive 2ml/L at 15 DAS 	<ul style="list-style-type: none"> • Operate CRIJAF Nail Weeder/ Single wheel jute weeder at 7-8 days and scrapper at 21 days followed by need based hand weeding • Pre-emergence herbicide: Spray Pretilachlor 50EC @3ml/L at 48hrs after sowing with irrigation • Post-emergence herbicide: Spray Quizalofop Ethyl 5EC @1.5-2ml/l + adhesive 2ml/L at 15-20 DAS
Water Management	<ul style="list-style-type: none"> • One pre-sowing irrigation • 1-2 irrigation at 20days interval during top dressing • Drainage channel in low land • Water requirement: 500-550 mm 	<ul style="list-style-type: none"> • One pre-sowing irrigation • 1-2 irrigation at 20days interval during top dressing • Drainage channel in low land • Water requirement: 425-450 mm 	<ul style="list-style-type: none"> • One pre-sowing irrigation • 1-2 irrigation at 20days interval during top dressing • Drainage channel in low land • Water requirement: 425-450 mm
Harvesting	<ul style="list-style-type: none"> • 110-120 DAS 	<ul style="list-style-type: none"> • 125-135 DAS 	<ul style="list-style-type: none"> • 130 DAS

	CROPS		
	JUTE	KENAF	ROSELLE
Retting	<ul style="list-style-type: none"> Apply CRIJAF Sona @ 25-30 kg/ha (Retted with free flowing water; In-situ retting) 	<ul style="list-style-type: none"> Apply CRIJAF Sona @ 25-30 kg/ha (Retted with free flowing water; In-situ retting) 	<ul style="list-style-type: none"> Apply CRIJAF Sona @ 25-30 kg/ha (Retted with free flowing water; In-situ retting)
Fibre yield	<ul style="list-style-type: none"> 30-40 q/ha 	<ul style="list-style-type: none"> 25-35 q/ha 	<ul style="list-style-type: none"> 25-30 q/ha
Cultivation cost (Approx)	<ul style="list-style-type: none"> ₹ 75000-85000 /ha 	<ul style="list-style-type: none"> ₹ 65000-70000 /ha 	<ul style="list-style-type: none"> ₹ 65000-70000 /ha
Net return (approx)	<ul style="list-style-type: none"> ₹ 85000-90000 /ha 	<ul style="list-style-type: none"> ₹ 60000-65000 /ha 	<ul style="list-style-type: none"> ₹ 60000-65000 /ha
Utility	<ul style="list-style-type: none"> For packaging industry (Hessian, sack, rope) Diversified use in textile industries, paper industries, building and automobile industries, decorative items, furnishing materials Jute leaf as vegetables, source of vitamins, antioxidants etc. 	<ul style="list-style-type: none"> Diversified use in textile industries, paper industries, building and automobile industries, decorative items, furnishing materials etc 	<ul style="list-style-type: none"> Textile industries Leaves used for making pickles, curries etc. Fleshy calyx as by-product is used for preparation of jam, jellies, roselle juice, medicinal purpose (anti-cancerous) Seed oil in automobile industry

	CROPS			
	SUNNHEMP	SISAL	RAMIE	FLAX
Area of cultivation	<ul style="list-style-type: none"> Almost all parts of the country 	<ul style="list-style-type: none"> Almost all states particularly Odisha, WB, Bihar, Jharkhand, Jammu (U.T.), Chattisgarh, Maharashtra, AP, Karnataka, MP etc. 	<ul style="list-style-type: none"> North-Eastern states-Assam, Meghalaya etc., Hills of West Bengal, Hills of Tamil Nadu, Goa, Ratnagiri hills of Maharashtra 	<ul style="list-style-type: none"> Foot hills and intermediate hills of Himalayan region (Uttarakhand, UP, North Bengal, Assam, Meghalaya), Nilgiri hills of Tamil Nadu



	CROPS			
	SUNNHEMP	SISAL	RAMIE	FLAX
Climate prevails in the growing states	<ul style="list-style-type: none"> • Temperature: T_{Max}: 30.0-36.0°C T_{Min}: 20.0-26.0°C • RH: 55-94% • Rainfall during cropping season: 1030 mm 	<ul style="list-style-type: none"> • Temperature: T_{Max}: 24.0-45.0°C T_{Min}: 10.0-30.0°C • RH: 40-96% • Rainfall: 600-1250 mm 	<ul style="list-style-type: none"> • Temperature: T_{Max}: 25.0-36.0°C T_{Min}: 10.0-27.0°C • RH: 40-96% • Rainfall during cropping season: 1500-2000 mm 	<ul style="list-style-type: none"> • Temperature: T_{Max}: 24.0-33.0°C T_{Min}: 11.0-20.0°C • RH: 60-80% • Rainfall during cropping season: 80-100 mm
Soil	<ul style="list-style-type: none"> • Loamy to sandy loam • pH: 6.0-7.5 	<ul style="list-style-type: none"> • Sandy to sandy loam soil loam including poor and marginal land • pH: 6.0-8.0 	<ul style="list-style-type: none"> • Loamy to sandy • pH: 6.5-7.0 	<ul style="list-style-type: none"> • Sandy loam to loamy • pH: 5.5-7.0
Varieties	<ul style="list-style-type: none"> • SH-4 • SUIN-053 • SUIN-037 • SUIN-03 • JRJ-610 • K-12 Black • K-12 Yellow 	<ul style="list-style-type: none"> • Hybrid sisal • Bamra hybrid- 1 	<ul style="list-style-type: none"> • R - 1411 • R - 67-34 	<ul style="list-style-type: none"> • JRF - 2
Sowing time	<ul style="list-style-type: none"> • Irrigated: Mid-April - May • Rainfed: May - June • For green manuring: May - June 	<ul style="list-style-type: none"> • Primary nursery: Feb - June • Secondary nursery: July • Planting in the main field: June - July 	<ul style="list-style-type: none"> • Rainfed: May - September • Irrigated: March-September 	<ul style="list-style-type: none"> • October (2nd fortnight) to November (1st fortnight)

	CROPS			
	SUNNHEMP	SISAL	RAMIE	FLAX
Sowing method	<ul style="list-style-type: none"> Line sowing Broadcasting (for green manuring) 	<ul style="list-style-type: none"> Double row system: Spacing at a distance of 1 m x 1m with inter-row space of 3m or 3.5 m or 4 m Single Row System: at a spacing of 2m x 1m 	<ul style="list-style-type: none"> Ridge and furrow system 	<ul style="list-style-type: none"> Line sowing
Spacing	<ul style="list-style-type: none"> Plant to plant: 5-7 cm Row to row: 25-30 cm 	<ul style="list-style-type: none"> Inter-row space: <ul style="list-style-type: none"> ◆ 4 m (4000 plants/ha) ◆ 3.5 m (4400 plants/ha) ◆ 3 m (5000 plants/ha) 	<ul style="list-style-type: none"> Plant to plant: 30 cm Row to row: 60 cm 	<ul style="list-style-type: none"> Row to row: 20-25 cm 2-3 lines of plants in one row
Planting material	Seed	Sucker : 5000 / ha	<ul style="list-style-type: none"> Rhizomes: 8-10 q/ha OR Plantlets/Stem cutting: (55,000-60,000/ha) 	Seed
Seed rate	<ul style="list-style-type: none"> 25 kg/ha (line sowing) 30 kg/ha (broadcasting) 			45-50 kg/ha
Nutrient management	<ul style="list-style-type: none"> FYM@ 5 t/ha NPK @ 20:40:40 (kg/ha) 	<ul style="list-style-type: none"> FYM@ 10 t/ha OR Sisal compost: 20 t/ha NPK @ 60:30:60 (kg/ha) 	<ul style="list-style-type: none"> FYM@ 5 - 10 t/ha NPK @ 20:10:10 kg/ha (after 45-60 days of planting) NPK @ 30:15:15 kg/ha (after each cutting) NPK @ 60:30:30 kg/ha (3rd year onwards) 	<ul style="list-style-type: none"> NPK @ 80:40:40 (kg/ha) FYM@ 5 t/ha

	CROPS			
	SUNNHEMP	SISAL	RAMIE	FLAX
Weed Management	<ul style="list-style-type: none"> Mechanical Operate CRIJAF Nail Weeder/ Single wheel jute weeder at 7-8 DAS and scrapper at 21 DAS followed by need based hand weeding Chemical Spray Quizalofop Ethyl 5% EC @ 40 gm a.i./ha at 25 DAS followed by one hand weeding at 10-25 days after spraying 	<ul style="list-style-type: none"> Two hand weeding in primary nursery at 15-20 days' interval Weeding and bush cleaning in main field during pre and post monsoon period before fertilizer application 	<ul style="list-style-type: none"> Spray Quizalofop Ethyl 10% EC @ 40 g a.i./ha or Quizalofop Ethyl 5% EC @60 g a.i./ha at 20 days after each cutting followed by one hand weeding after 10 days Protected application of non-selective herbicide like Paraquat dichloride @0.13-0.25% in inter-row space after each harvesting (for >6 months old plantations) 	<ul style="list-style-type: none"> Mechanical Weeding with CRIJAF Nail Weeder / Single wheel jute weeder at 7-8 DAS followed by scrapper at 21 DAS followed by need based hand weeding Spray Quizalofop Ethyl 5% EC @ 40 gm ai/ha at 30 DAS followed by hand weeding at 10-25 days .
Water Management	<ul style="list-style-type: none"> 2-3 irrigations at 15-20 days intervals for fibre crops Water requirement: 400-450 mm 1 pre-sowing irrigation for green manuring 	<ul style="list-style-type: none"> Mainly rainfed If facilities exist, drip irrigation @ 4 lit/hr at two weeks interval for 2 hrs during dry summer Water requirement: 700-800 mm 	<ul style="list-style-type: none"> 1-2 irrigation(s) at 20-25 days interval during day period Make drainage channel during heavy rains Water requirement: 700-950 mm 	<ul style="list-style-type: none"> One pre-sowing irrigation 2-3 post-sowing irrigation at 20-25, 40-45 and 65-70 DAS Water requirement: 250-300 mm

	CROPS			
	SUNNHEMP	SISAL	RAMIE	FLAX
Harvesting	<ul style="list-style-type: none"> • 90-100 DAS (Fibre) • 40-50 DAS (Green manuring) 	<ul style="list-style-type: none"> • First cutting starts nearly from 3 years old plantation during November to February and continue upto March – April. 	<ul style="list-style-type: none"> • Harvest <ul style="list-style-type: none"> ▣ When flowers begin to open ▣ When stems change colour from green to brownish ▣ When leaves starts yellowing 	<ul style="list-style-type: none"> • 100-110 DAS
Retting and fibre extraction	<ul style="list-style-type: none"> • Retting is done preferably in slow-moving water for 4-6 days depending upon temperature. After draining out excess water from washed fibre, it is sun dried and fibre is extracted. 	<ul style="list-style-type: none"> • It does not require retting for fibre extraction, fibre is extracted from leaf by decortication, then washed in clean water and sun dried. 	<ul style="list-style-type: none"> • Retting not required, fibre extracted from stem by decortication then washed in clean water and sun dried. • The raw extracted fibre is degummed by chemical means using 1% NaOH solution for 1-2 hrs at boiling temperature. 	<ul style="list-style-type: none"> • After harvesting, the plants are kept in the field for 6-10 days for sun drying. Then retting is done in water for 3-4 days. Then plants are kept under shade for removal of water, and extracted the fibre manually or using extractor.
Fibre yield	<ul style="list-style-type: none"> • 10-12 q/ha 	<ul style="list-style-type: none"> • 12-15 q/ha (3rd year onwards upto 10-12 yrs) 	<ul style="list-style-type: none"> • Fibre: 16-22 q/ha/yr • Rainfed crop: 4 cuttings/year • Irrigated crop: 5-6 cuttings/year • Rhizome: 20 t/ha (after 5 years of plantation) 	<ul style="list-style-type: none"> • Fibre: 14-16 q/ha



	CROPS			
	SUNNHEMP	SISAL	RAMIE	FLAX
Cultivation cost (approx.)	<ul style="list-style-type: none"> • ₹ 45,000 – 50,000/ha 	<ul style="list-style-type: none"> • 1st year: ₹ 65,000/ha • 2nd year: ₹ 25,000/ha (for fertilizer application and weeding) • 3rd – 12th year: ₹ 40,000/ha/year 	<ul style="list-style-type: none"> • 1st year: ₹ 75,000 – 80,000 /ha • 2nd – 4th year: ₹ 45,000 – 50,000 /ha/yr • 5th year: ₹ 2,75,000/ha (incl. ₹ 2,27,500/ha for rhizome uprooting) 	<ul style="list-style-type: none"> • ₹ 70,000 – 75,000/ha
Net return (approx.)	<ul style="list-style-type: none"> • ₹35,000 – 45,000/ha 	<ul style="list-style-type: none"> • ₹ 55,000/ha/year (3rd year onwards) 	<ul style="list-style-type: none"> • Fibre (2nd-5th yr): ₹ 75,000-1,00,000/ha/yr • Rhizome (5th year): ₹ 3,50,000 – 3,70,000/ha 	<ul style="list-style-type: none"> • ₹ 1,75,000 – 2,20,000/ha
Utility	<ul style="list-style-type: none"> • Making handmade paper and twine, rag yarn for preparing fishing net, sacks and cordage. • High eco-system value, potential green manure crop for soil health management, Carbon sequestration, climate change mitigation. 	<ul style="list-style-type: none"> • Used for making ropes for shipping industry, twines and general cordage. • Low cost paper, dartboard, buffing cloth, filters, geo-textiles, mattress, carpets, net, brush, padding, upholstery, handicrafts etc. • Leaf has medicinal properties (anti-inflammatory). • Watershed management 	<ul style="list-style-type: none"> • Used for making apparels, curtains, upholsteries, towels, canvas, filter cloths etc. • Waste fiber used for preparing currency notes, cigarette papers, handmade paper etc. • Wood portion can be used for producing plywood, particle board, fibre board etc. 	<ul style="list-style-type: none"> • Making linen fabrics such as damasks, sheeting and lace • Coarser grades used for manufacturing of rope and twine, canvas and webbing equipment • Paper industry for making bank notes, rolling paper for tea bags and cigarette paper • Flax seed for medicinal purpose (diabetic treatment, antioxidants, digestion, breast cancer, omega-3 fatty acid dietetic heart health).

B. Farm mechanization

The ICAR-CRIJAF has developed many farm implements for small and marginal jute and allied fibres' farming community.

i) Sowing

CRIJAF Multi-row Seed Drill: CRIJAF Multi-Row Seed Drill is a low cost manual seed sowing machine. It reduces seed rate by 50 % i.e. 3-4 kg/ha and saves labour for weeding and thinning.

CRIJAF Improved Multi-row seeder: CRIJAF Improved multi-row seeder is a light weight four-row manual seed sowing machine for line sowing of jute and other small seeded upland crops. The durable and transparent seed box facilitates the visibility of seed quantity in the box during operation. The bigger size ground wheels with pegs and the bearings attached on drive shaft of the machine facilitates easy movement of machine on tilled soil. There is reduction of about 50 % of seed requirement i.e. 2.8-3.0 kg/ha against 6-7 kg/ha in broadcast sowing method.



CRIJAF Multi-row Seed Drill



CRIJAF Improved Multi-row Seeder

ii) Weeding

CRIJAF Nail Weeder: CRIJAF Nail weeder has been developed to weed out young composite weed flora including germinating ones from line sown and broadcast field crops (jute, mesta, cereals, pulses, vegetables etc.) since 3 - 7 days of crop sowing.

CRIJAF Herbicide Applicator: CRIJAF Herbicide applicator eliminates the risk of crop damage by directed herbicide application and effective for other crops as it has no drift hazard.

CRIJAF Single Wheel Jute Weeder: It is a manual operated weeding device for controlling composite weed flora in line sown up-land crops. The effective field capacity (EFC) of machine is about 0.028 ha/ hr, thus 35 man-hours is required for weeding of one hectare area. The unit cost of the machine is ₹ 1,850/-..



iii) Fibre extraction

CRIJAF Ramie & Sisal Fibre Extractor: It is a portable ramie and sisal fibre extractor /decorticator operated by single-phase 3 hp electric motor is used to extract fibre from both ramie stem/plant and sisal leaf. The throughput capacity and material capacity for sisal fibre extraction is about 330-380 kg leaves per hour and 12-14 kg dry fibre per hour, respectively.

CRIJAF Flax Fibre Extractor: It is a portable flax fibre extractor operated by single-phase 1 hp electric motor is used to extract fibre from retted and dried flax stalks. To extract fibre of one hectare area it needs about 22 working days i.e. 44 man-days for its operation.



CRIJAF Ramie & Sisal Fibre Extractor



CRIJAF Flax Fibre Extractor

C. Pest and diseases management

Management of insect pests of jute: Based on single-and multiple-pests-economic injury levels, two sprays of spiromesifen 240 SC @ 0.7 ml/lit at 36 and 46 days after sowing (DAS) against yellow mite and two sprays with profenophos 50 EC were recommended at 66 and 76 DAS for hairy caterpillar and semilooper caterpillar when the mite population exceeds above 42 mites/cm² on second unfolded leaf and damage caused by lepidopteran pests is 10% plant damage respectively.

Chemical control of mealybug and spiral borer in kenaf: Preventive seed treatment with imidacloprid 600 FS followed by foliar spray of profenophos 50 EC @2.5 ml/lit or chlorpyriphos 20 EC @2.5 ml/lit of water is highly effective in protecting the plants against mealybug, flea beetle and spiral borer in kenaf.

Bleaching powder as an alternative for management of jute stem: Preventive soil application of bleaching powder @ 30 kg/ha at 7 days ahead of sowing is recommended for stem rot disease control in jute. It is attributed to increasing soil pH and direct detrimental effect on pathogen without adverse effect on beneficial microbes.

Preventive management of stem rot of jute: Sowing of jute crop in first week of April integrated with application of tebuconazole 25.9 EC (0.1%) as seed treatment and foliar spray at 45DAS is effective in the management of stem rot disease which significantly reduces the stem rot incidence and further spread of the disease till 120 DAS.

Production of disease free quality jute seed by altering sowing dates and fungicide scheduling: Sowing of jute seed crop during mid-August followed by foliar spraying of carbendazim 50WP @ 0.01% either at pod maturity or pod setting stage is most effective for reducing the seed infection and maximization of quality jute seed yield with higher viability.



Spray against yellow mite infested crop Stem rot of jute Hairy caterpillar infested plant
Semilooper infested jute crop

D. Jute retting

The institute has developed improved jute retting process with microbial formulation 'CRIJAF SONA'

i. Innovation of microbial formulation 'CRIJAF SONA' for jute retting

To improve fibre quality and to make the fibre internationally competitive through efficient retting, ICAR-CRIJAF developed a microbial consortium 'CRIJAF SONA'. This microbial formulation consists of three very efficient pectinolytic strain of *Bacillus* spp., having very high pectinolytic and xylanase activities without any cellulase activity. The technology has following advantages:

- Reduces the retting duration by 6 -7 days.
- Improves the fibre quality by at least 1- 2 grades.

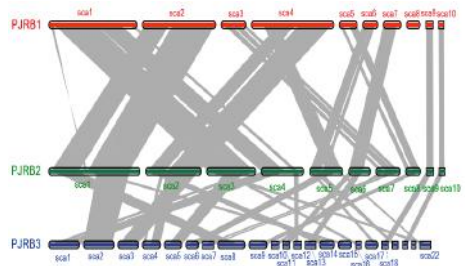


Golden fibre through CRIJAF SONA

- Increases fibre yield by 8 - 10 %.
- Earn additional income of ₹ 12,000 - 15,000/ha.
- It minimizes the water requirement by 75% and increases water use efficiency by 2 to 3 times

ii. Genome sequencing of jute retting microbes

Comprehensive genome-scale analyses CRIJAF SONA retting consortium unambiguously established the identity and functional uniqueness of these bacterial strains. The genome sizes of the strains are ~3.8Mb with 3729 to 4002 protein-coding genes. Detailed annotations of the protein-coding genes revealed different carbohydrate-degrading CAZy classes including pectin lyase genes.



iii. Temporary retting pond :



Places where retting water is not available, temporary retting pond can be created by digging or raising one meter bund in the selected area. For one bigha (0.13 ha) of jute, the

pond size will be 10 m X 8m X 1m. The in-situ retting will save the carrying cost of jute bundle of Rs 4000-6000/acre from field to nearest water body besides enhancing farm income through vegetables.

iv. In-situ retting tank based self-reliant eco-farming.

Availability of water for jute retting and high cost of transportation of jute bundles from field to nearest waterbody are the main constraints for jute cultivation. To create water resources, to improve the fibre quality and the reduce the cost of cultivation water can be harvested permanently through in-situ tank, where retting can be done near the jute plots by taking 3 to 5% of land of one acre land for retting of one acre of jute in the staggard manner for production of high grade fibres. The farmers can get income by Rs. 25000-30000/acre more by adopting multiple farming system besides reduction of carrying cost of Rs 4000-6000/acre. The water harvesting system has lot of eco-system values too like runoff recycling, ground water recharge etc.



Runoff recycling through in-situ jute retting tank for retting with rainwater

In-situ retting tank based self-reliant farming at ICAR-CRIJAF

v. To improve the fibre quality, ICAR-CRIJAF has also recently initiated a project “Cement tank based retting of jute and mesta with free-flowing water” The in-



High grade fibre (TDN 1-TDN 2) through retting with free flowing water



Jute retting with free flowing water



Retting of jute with CRIJAF SONA

situ retting, retting with free flow water with CRIJAF SONA will help to become 100% self-reliant in quality jute production, paving the way for affordable, sustainable and eco-friendly natural biodegradable fibre and can be used for versatile diversified application by substituting plastics and synthetics which will facilitate to create clean and green environment.

3. Institute initiative for transfer of technology

FLDs conducted under the different scheme (NFSM, Jute-ICARE, STCR, NICRA etc.)

Different technologies namely (i) Certified quality seed of improved tossa jute variety (JRO 204), (ii) Line sowing of jute by CRIJAF multi-row jute seed drill, (iii) Mechanical weeding by CRIJAF Nail Weeder and (iv) Improved microbial jute retting technology using ‘CRIJAF Sona’ etc. are largely transferred among the growers of jute and allied fibres in West Bengal, Bihar, Assam and Odisha through various schemes like Jute- Improved Cultivation and Advanced Retting Exercise (Jute-ICARE), National Food Security Mission (NFSM), National Innovation for Climate Resilient Agriculture (NICRA), Scheduled Caste Sub Plan (SCSP), Tribal Sub Plan (TSP), Mera Gaon Mera Gaurav (MGMG) etc.

Table 1 : FLD from 2011-12 to till date under different schemes

Particulars	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Area under FLD (ha)	44.60	64.68	47.34	50.07	12399	26356	70716	99122	107179	316031
No. of farmers covered	131	263	234	288	21849	41986	102717	193540	244430	605438
No. of FLD	112	162	118	125	30998	65892	176789	247807	268074	790077

Particulars	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total
Major areas of demonstration	West Bengal, Bihar	West Bengal, Bihar	West Bengal, Bihar	West Bengal, Bihar	West Bengal, Bihar, Orissa, Assam, Meghalaya	West Bengal, Bihar, Orissa, Assam, Meghalaya	West Bengal, Bihar, Orissa, Assam, Meghalaya	West Bengal, Bihar, Orissa, Assam, Meghalaya	West Bengal, Bihar, Orissa, Assam, Meghalaya	
Names of the scheme	NFSM*	NFSM	NFSM	NFSM	NFSM, Jute-ICARE	NFSM, Jute-ICARE	NFSM, Jute-ICARE	NFSM, Jute-ICARE	NFSM, Jute-ICARE	

b) Human resource development / training conducted under different schemes

This includes capacity enhancement of the extension personnel and the researchers through training. National / state level trainings and farmers-scientists interactions are conducted regularly for capacity enhancement of farmers, researchers and extension officials of the country with latest technical know-how. These programmes cover the holistic production technologies pertaining to jute and allied fibre crops. Short duration (5 days) as well as long duration (21 days) training programmes on entrepreneurship development through diversification of jute products are also conducted on regular basis for farm women of weaker section to produce diversified products from jute fibre and marketing of the same through cooperative approach. The Institute has been successful in mobilizing financial support from the Directorate of Jute Development, National Jute Board, Jute Corporation of India, Ministry of Agriculture & Farmer's Welfare, Govt. of India for conducting different training programmes

Table 2 : Major trainings programmes conducted by ICAR-CRIJAF under different schemes during last five years (2015 -20)

Scheme /Project	Sponsoring agency	No. of trainings	No. of participants
Jute-ICARE	National Jute Board, Ministry of Textile	212	11884
National Food Security Mission (NFSM)	Directorate of Jute Development, Ministry of Agriculture and Farmers Welfare	47	2665
Tribal Sub Plan (TSP)	Indian Council of Agricultural Research	50	2715

Scheme /Project	Sponsoring agency	No. of trainings	No. of participants
Scheduled Caste Sub Plan (SCSP)	Indian Council of Agricultural Research	9	498
Natural Resource Management for Climate Smart Jute Farming	Department of Science & Technology, Govt.of India	8	315
Skill India	Agricultural Skill Council of India	3	60
Human Resource Development, ICAR-CRIJAF	Indian Council of Agricultural Research	8	119
Soil Test based Crop Response (STCR)	Indian Council of Agricultural Research	10	533
	TOTAL	347	18789

On-farm testing

The Institute conducts programmes where the farmers and the extension personnel are exposed to the improved production technologies of jute under on-farm conditions in different parts of the jute and allied fibre growing states. The package includes use of proven technologies on improved varieties, seed treatment, method of sowing, fertilization practices, weed control, pest and disease management and improved retting method and value addition.

Varietal evaluation

Table 3: Economics of cultivation of improved jute varieties

Variety	Fibre yield (q/ha)	Cost of cultivation (₹/ha)	Gross return (₹/ha)	Net return (₹/ha)	B:C ratio
JRO 204 (Suren)	32.74	69,918	176272	106354	2.52
JBO2003 H (Ira)	30.38	69,918	141661	71743	2.03
JRO 2407 (Samapti)	29.46	69,918	137765	67847	1.97
CO 58 (Sourav)	29.24	69,918	136875	66957	1.96
JRO 128 (Surya)	28.40	69,918	132914	62996	1.90
JRO 524*(Navin)	27.63	69,918	129988	60070	1.86

*Check variety; Price of jute fibre: ₹ 4000-4500/q and jute stick: ₹300-500/q

Use of ICT tools

► **JAFexpert-** a web based expert system: It is an automated system containing information on growing of jute and allied fibre crops like mesta, sunnhemp, ramie, sisal and flax to help farmers and extension workers to effectively manage these fibre crops.



Release of JAF-Safe apps by Hon'ble Ministers

- **JuteMet:** It is a web-based agro-meteorological database management system-cum-agro-advisory system for management of climate data for disseminating weather-based agro-advisory services on jute and allied fibre crops to help farmers and other stake holders in India.
- **JuteMarkerdb:** It is an integrated web-based relational database to access publicly available molecular markers in jute. The database aims to host molecular markers developed and/or shared by the researchers working on jute.
- **JAF-Safe:** It is an android based app dealing with the identification, nature of damage and management of insects and diseases of jute and allied fibre crops.
- **JAF KISAN:** The institute has also developed JAF-KISAN app for yield gap analysis of jute between potential yield and actual yield.

Media coverage – print and electronic media

After spread of COVID-19, ICAR-CRIJAF, Barrackpore started advisory services at 10 days interval in three languages (English, Bengali and Hindi) since March 2020 for the benefit of farming community and other stakeholders (master trainers, block/field supervisors/Mill workers) through multiple digital platforms like WhatsApp, mobile call, video conference,



national and regional news media. So far this advisory service is reaching to more than 10 lakh farmers of West Bengal, Bihar, Assam, Odisha, Andhra Pradesh and Tamilnadu. Other organizations like KVK, National Jute Board and State



Agriculture Department are also using it for the benefit of the farming community in jute and allied fibre growing states.

The institute achievements has also been covered by different regional and national media.



पटसन सड़न अनुसंधान को मिली बड़ी सफलता
 KOLKATA 17 July, 2020
 पटसन सड़न अनुसंधान को मिली बड़ी सफलता। जूट के पटसनों में सड़न रोकने में सफलता मिली है। इससे जूट के उत्पादन में बड़ी वृद्धि होगी।



4. Promotion of ICAR-CRIJAF Technologies through commercialization

Name of the technology	Farm	Unit Cost
CRIJAF Multi Row Seed Drill	<ul style="list-style-type: none"> M/s. Joy Maa Tara Enterprise, Kolkata M/s. Krishi Udyog, Howrah 	3 Row: 3500/- 4 Row: 4100/- 5 Row: 4500/-
CRIJAF Nail Weeder	<ul style="list-style-type: none"> M/s. Creative Displayers, Kolkata M/s. Krishi Udyog, Howrah 	1850/-
CRIJAF SONA	<ul style="list-style-type: none"> M/s Next to Nature, Assam Bengal Biotech and Reserch, Midnapore 	60/- per kg 50/-per kg
Ramie & Sisal Fibre Extractor	<ul style="list-style-type: none"> M/s Akriti, Sambalpur, Odisha 	28,500/- without electric motor 43,500/- with electric motor
Flax Fibre Extractor	<ul style="list-style-type: none"> M/s Santra & Company, Howrah 	Type I: 40,900/- Type II: 43,525/-
Single Wheel Jute Weeder	<ul style="list-style-type: none"> M/s Creative Displayers, Kolkata 	2000/-

5. Value addition and value chain establishment

During last five years, ICAR-CRIJAF has taken various activities like training and demonstration programme to strengthen the SHGs and FPOs in West Bengal. Capacity building programmes were organized for the Women Self Help Groups formed under FPO. Technical support was extended to three FPOs in North 24 Parganas covering around 1600 farmers and farm women. Two Self Help Groups (SHGs) each from three FPOs in North 24 Parganas were trained in value addition

of jute fibre and fabrics in order to facilitate the FPOs for building their business plans. In addition to this, necessary linkages were created with FPO through ICAR-CRIJAF and its KVK for need based technical support to the farmers' interest groups registered with FPO.



Women Self Help Groups (SHGs) groups undergoing skill training at ICAR-CRIJAF

- ICAR CRIJAF has taken initiatives in developing the value chain in jute by giving special emphasis on value addition of jute and allied fibres.
- Farm women from jute growing areas were trained on making jute bags and fibre based handicrafts. These farm women were organized in to different Self Help Groups.
- The groups are further linked with farmers producer company for easy procurement of raw materials and marketing of final value added products.
- Value chain is being established with the involvement of all the stakeholders right from seed production to jute fibre based diversified products.

6. Institute initiative for byproduct utilization of jute and allied fibre

- Jute variety (JROB-2) developed by the institute has high biomass yield coupled with high potential fibre yield (41 q/ha). It also has higher cellulose content in its green biomass, making it suitable for biofuel production. A project sponsored by Department of Science and Technology (DST) project on conversion of jute biomass to biofuel showed good promise for biofuel production from JROB-2 compared to existing jute variety like JRO 524.

- A kenaf variety MT 150 is ideal for paper pulp production (60 tonne green weight / ha). The newsprint produced from MT 150 is excellent in quality, even better than Russian and Canadian newsprints. On an average 8 tonne of paper pulp is expected from 1 ha of mesta cultivation.
- Four entries have been identified for consumption as a leafy vegetable. Initial screening of methanolic extracts from jute leaves identified several health promoting phenolics and flavonoids. Transcriptome characterization and downstream analysis leading to identification of over 300 genes involved in biosynthesis of phenylpropanoids and flavonoids in jute. The nutritive value of jute leaf will help in immunity boosting.
- Roselle calyces can be used for different purposes like preparation of chutney, pickle, soup or as vegetable in different parts of the country. Varieties for these purposes are in pipeline. Roselle juice has high medicinal values also.



Jute leaf and jute leaf based food



Roselle calyx and juice

7. Linkage and Collaboration

Organization	Activities
Department of Science and Technology, West Bengal	Entrepreneurship development, Training
State Department of Agriculture, Govt. of West Bengal	
National Jute Board (NJB), Kolkata	
Jute Corporation of India (JCI), Kolkata	Demonstration, Extension programme



Organization	Activities
Directorate of Jute Development (DJD), Kolkata	Training, Demonstration
BCKV, Kalyani, West Bengal	
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar	
Assam Agricultural University, Jorhat, Assam	
UBKV, Coochbehar, West Bengal	
Bihar Agriculture University, Bhagalpur, Bihar	
ICAR-NINFET, Kolkata	Research, Demonstration, Extension
Jute Mills of West Bengal	
SEVA (NGO), West Bengal	Entrepreneurship, Organic jute cultivation
Calcutta University, Kolkata	
Presidency University, Kolkata	Academic (M.Sc., Ph.D)

8. Facilitation of Government Policy

b) Seed policy: To popularize the HYVs among the farmers ICAR-CRIJAF is providing entire Breeders Seed requirement of jute and allied fibre crops in the country.

WAY FORWARD

- ❖ Functional genomics and pre-breeding for yield & quality improvement, biotic and abiotic stress management
- ❖ Development of cultivars suitable for vegetables, paper pulp, fibre composites, geotextiles and JDPs
- ❖ Exploitation of new generation herbicides and standardization of application technology integrated with cultural practices
- ❖ Improve retting consortium through integration of strains with greater pectinolytic activity, environmental stability and shelf life
- ❖ Nutrient management package under fragile climatic and soil fertility condition
- ❖ Exploitation of endophytes and mycorrhizal microbes for sustained resistance against pests and diseases
- ❖ Food and nutritional values of jute and allied fibre by-products



भा.कृ.अनु.प. -केन्द्रीय पटसन एवं समवर्गीय रेशा अनुसंधान संस्थान
ICAR-Central Research Institute for Jute and Allied Fibers
An ISO 9001: 2015 Certified Institute
Barrackpore, Kolkata-700121, West Bengal
www.crijaf.icar.gov.in