ICAR- CRIJAF : A PROFILE

ICAR-Central Research Institute for Jute and Allied Fibres

(An ISO 9001:2008 Certified Institute)

Indian Council of Agricultural Research

Barrackpore, Kolkata 700120, West Bengal

www.crijaf.org.in

INTRODUCTION: 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, now in Bangladesh. 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 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 (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). One KVK under the administrative control of ICAR-CRIJAF was established in 2006 to cater the need of Burdwan district of West Bengal.

Dr. Rafi Ahmad Kidwai, Union Minister for Food and Agriculture laid the Foundation stone of JARI, 9 Feb. 1953

Dr. B.C. Kundu Founder Director, JARI

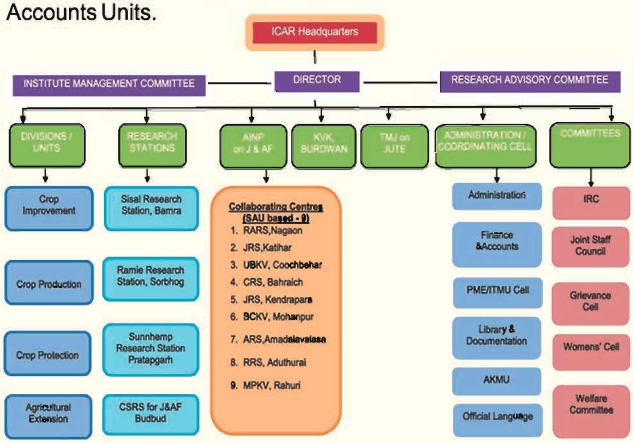
VISION: Provide leadership in research and technology development to make jute and allied fibre farming profitable and sustainable

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:

- Improvement of jute (*Corchorus capsularis & C. olitorius*), mesta (*Hibiscus cannabinus* and *H. sabdariffa*), sunnhemp (*Crotalaria juncea*), ramie (*Boehmeria nivea*), sisal (*Agave sisalana*) and flax (*Linum usitatissimum*) for higher fibre yield & better quality.
- Improvement of jute and allied fibre crops for their tolerance to biotic and abiotic stresses.
- Development of economically viable and sustainable production technologies & cropping systems with jute and allied fibre crops.
- Development of appropriate post-harvest technologies for improving the quality of fibre.
- Transfer of technologies and development of human resource in relation to jute and allied fibre crops.

ORGANIZATIONAL SET UP: CRIJAF is organized into 3 divisions, viz., Crop Improvement, Crop Production and Crop Protection, and one Section *viz.* Agricultural Extension supported by Farm, Workshop, Library, PME Cell, AKMU, ITMU, Administration and Finance & Accounts Units.



MANPOWER

Category	Sanctioned strength	CRIJAF (HQ)*	Substation*				Total*
			CSRSJAF	RRS	SRS	ShRS	
Scientist	74+1	44	03	02	01	02	52
Technical	108	40	07	05	04	04	60
Administration	62	25	01	03	02	02	33
SSS	92	26	02	00	02	02	32

★ Staff in position as on 2015-16

Infrastructure: The Institute has well equipped laboratories and field facilities for conducting basic, applied and strategic research. The Institute is established in 61.04 ha at CRIJAF (HQ), Barrackpore, 56 ha at Ramie Research Station, Sorbhog, Assam, 103.6 ha at Sisal Research Station, Bamra, Odisha, 9.18 ha at Sunnhemp Research Station, Pratapgarh, UP and 65 ha at Central Seed Research Station for Jute and Allied Fibres, Budbud.

Research laboratory	Farm and other facilities	Central facilities
Gene bank, Plant Breeding and Biotechnology Lab, Retting & microbiology lab, Water technology, Plant physiology lab, Engineering Workshop, Glass house, Advanced Crop Protection lab	Experimental Blocks, Germplasm Blocks, Irrigation System, Farm Implement, Engg. Workshop, Guest House, Staff quarter	Library, Lecture, conference Hall Auditorium, AKMU Cell, Agromet. observatory, Hindi Cell ITMU / PME cell, Soil-Plant-water testing Lab

Genetic resources: In collaboration with NBPGR, New Delhi and International Jute Study Group (Bangladesh), gene pool including wild species and important breeding stocks (4723) of jute and allied fibre was established at the institute. Characterization and evaluation of 928 accessions of *C. olitorus,* 1579 accessions of *C. capsularis* and 64 accessions of flax have already been documented.

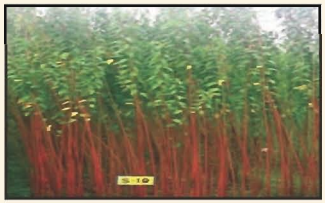
GERMPLASM STATUS IN GENE BANK OF CRIJAF

Crop species	Accession
C. capsularis	942
C. olitorius	1683
C. species	356
H. cannabinus	712
H. sabdariffa	605
H. species	125
L. usitatissimum	114
Crotalaria juncea	149
C. species	75
Agave species	78
Boehmeria species	2
B. nivea	57

Germplasm maintenance field

IMPORTANT RESEARCH ACCOMPLISHMENTS

Development of varieties: ICAR-CRIJAF is leading the Crop Improvement programme of jute and allied fibre crops in the country and successfully incorporated the desirable traits in the new varieties. A number of short duration, high yielding and premature flowering resistant *Olitorius* varieties were developed which replaced about 90 % of *C. capsularis* area and increased the fibre yield (national average) from 11 qha^{-1} (1960s) to 25 qha^{-1} (2015). Some important and popular varieties among the 60 varieties (39 jute and 21 allied fibres) developed by the institute are given below.



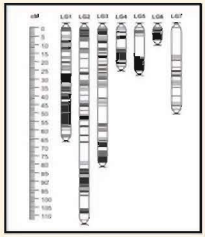
Recently released varieties of JAF

Varieties of JAF released during 2000-15

Tossa jute (*C. olitorius*)		Kenaf (*H. cannabinus*)	
JRO 128 (Surya)	2002	MT 150 (Nirmal)	2004
Bidhan Rupali	2002	JBM-2004-D (Sumit)	2008
S 19 (Subala)	2004	JRM 3 (Sneha)	2010
JRO 204 (Suren)	2007	JRM 5 (Shrestha)	2010
AAU-OJ-1 (Tarun)	2007	JBM 81 (Shakti)	2013
JBO-2003-H (Ira)	2008	JBM 71 (Shanti)	2013
CO-58 (Sourav)	2010	JRKM 9-1 (Satyen)	2014
JBO 1 (Sudhangsu)	2010	JBMG 4 (Bimal)	2014
JRO 2407 (Samapti)	2011	Roselle (*H. sabdariffa*)	
JROM 1 (Pradip)	2013	Non Bris-4 (Jaya)	2005
JROG 1 (Rithika)	2014	AMV 5 (Durga)	2006
White jute (*C. capsularis*)		GR 27 (Madhuri)	2007
Bidhan Pat 3	2000		
Bidhan Pat 1	2001	AMV-7	2011
Bidhan Pat 2	2001	JRR-1	2011
JRC 80 (Mitali)	2004	CRIJAF R-2 (Roselle)	2014
JRC 517 (Sidhartha)	2009	CRIJAF R-8 (Sampurna)	
JRC 532 (Sashi)	2009	Sunnhemp (*Crotalaria juncea*)	
RRPS-27-C-3 (Monalisa)	2009	SH-4 (Sailesh)	2004
NDC 2008 (Ankit)	2009	SUN-053 (Swastika)	2009
JBC 5 (Arpita)	2010	SUIN 037 (Ankur)	2013
KJC 7 (Shreshtha)	2011	JRJ-610 (Prankur)	2015
JRCM 2 (Partho)	2013	Flax: (*Linum usitatissimum*)	
JRC 9057 (Ishani)	2014	JRF 2 (Taira)	2015

Genome size of jute : *C. capsularis* cv. JRC 212 or Branca has the smallest genome size of ~246 Mb, while the mutant CMU-010 has the largest (~341 Mb) genome. *C. olitorius* cv. Sudan Green, a genome size of ~315 Mb is the smallest genome among the *tossa* jute cultivars, whereas JRO 524 or S 19 has the largest genome with an average of ~330 Mb. Of all the *Corchorus* species, *C. fascicularis* has the smallest nuclear genome (188 Mb) followed by *C. aestuans* (194 Mb), and except for *C. pseudo-olitorius*, all the other wild species have smaller nuclear genomes than those of the cultivated jute species.

RAD-based linkage map in jute : A high-density SNP linkage map, for the cross Sudan Green (SG) × bast-fibre-shy (bfs), has been developed in dark jute (C. olitorius) using restriction-site-associated DNA sequencing (RAD-seq). Seven linkage groups (LG1-LG7) containing a total of 503 RAD markers were identified. The total length of the linkage map was 358.5 cM, with an average marker interval of 0.72 cM. LG2 had the longest (112.5 cM) and LG6 the shortest (7.4 cM) genetic distance, whereas LG1 had the highest (139) and LG7 the lowest (22) numbers of markers.



A restriction-site-associated DNA (RAD) linkage map of jute.

Farm Mechanization

Multi-Row Seed Drill: Manually operated multi-row (4 and 5 rows) seeder has been developed for line sowing of jute. Seeder is operated by a man/woman with efficiency of 5-6 hrs/ha. Seed requirement is 3-4 kg/ha (about half of broadcast method). Line sowning favours better intercultural operations especially weeding.

Nail Weeder: Nail weeder has been developed to control young composite weed flora including germinating ones from line sown field crops (jute, mesta, cereals, pulses, vegetables) and other horticultural crops after 3-4 days of crop sowing with minimum disturbances to main crop seedlings.

CRIJAF-Ramie and Sisal Fibre Extractor: A portable ramie and sisal fibre extractor operated either by single-phase 3 HP electrical motor or by 3.5 HP diesel engine provides improved processing of ramie and sisal with less energy input and reduced cost. The throughput capacity and material capacity of ramie fibre extraction is about 300-350 kg plants/hr and 10-12 kg dry fibre/hr.

Multi-row seed drill

Nail Weeder

Retting Technology : Talc based microbial formulation - "CRIJAF SONA" consisting of three isolates of *Bacillus pumilus* having very high pectinolytic and xylanolytic activity without any cellulase activity was successfully tested in various agro-climatic conditions under AINP JAFs. Besides, CRIJAF has carried out large scale demonstration in all the jute & mesta growing states during 2012-13 to 2015-16. It was established that the formulation can reduce retting duration by at least 6 to 7 days, improves the fibre colour, strength, lusture and ultimately the fibre quality by 1 to 2 grades. The shelf life of the formulation is more than 5 months under room temperature and 25-30 kg formulation is required for retting of jute/mesta harvested from1ha area.

Application of CRIJAF SONA

Improved quality fibre

Jute Informatics: JAF expert, a web-based client-server application has been developed with knowledge related to diagnosis and management of jute. The system prompts the user to guided information, based on their selection. This user-system interaction steps are displayed through the 'Question & Answer Session'

Home page of JAF expert

Seed Production : ICAR-CRIJAF has standardized, established and promoted the jute seed production technology in drier tract of West Bengal for extensive seed production of released high yielding varieties (cv. JRO-204, JRO-8432, JRO-128, S-19 and JBO-2003H) branded as 'CRIJAF SEED' for enhancing variety replacement. The production of entire breeder seeds of jute and allied fibre is done by CRIJAF.

Jute seed crop, seed distribution and training for seed production

Alternate planting materials of ramie : Alternate planting materials using waste stalk (<2 feet), mechanical planting method and fibre extraction of ramie could enhance the productivity and profitability of ramie cultivation.

One day after planting

45 days after planting

Degumming of ramie fibre : CRIJAF has developed a novel process in which a bacterium, *Bacillus pumillus* DKS1 having high pectinase activity is used in a mild alkali solution (0.1%) for degumming of ramie fibre. The gum content of ramie fibre reduced significantly as evidenced by the weight loss of ramie fibre (25% in case of small scale and 24% in case of large scale degumming). The fibre tenacity and fineness can also be improved by this technology.

Ungummed fibre

Degummed fibre

TRANSFER OF TECHNOLOGY

Transfer of technology : Capacity enhancement of the extension personnel, researchers and farmers through organizing various training programmes, FLDs, group meetings / awareness camps, farmers' day, seed day, and visits of the farmers and the students from different institutions and states to appraise them on the latest technological innovations. In addition, the Institute participated in melas / exhibitions organized by different institutions in the country & also conducted T.V./Audio programmes.

Farmers' day

Seed day

Demonstration of Sisal Nursery raising

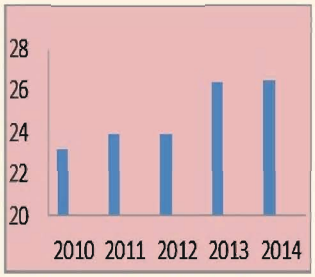
Training on preparation of JDPs

Large scale technology transfer on Improved Cultivation and Advanced Retting Exercise (ICARE)

ICAR-CRIJAF has been identified as a strategic collaborator by National Jute Board under Ministry of Textiles, Govt. of India for popularizing the improved production technologies to the jute farmers (35000) covering an area of 11,500 ha. The project was implemented in two blocks viz. Karimpur I & Karimpur II of Nadia district, Berhampore block of Mushiradabad district of West Bengal and Nagaon district of Assam. Under this project, the certified seed of jute (JRO 204), seed drill for line sowing of jute, nail weeder for mechanical weed control and CRIJAF SONA, a microbial formulation for faster retting and quality fibre production were provided to the growers. Besides these, the scientists from CRIJAF also imparted training to the master trainers and farmers for successful implementation of the project.

Impact of Research and Technology Transfer

- During the last five years productivity of jute has increased by around 15% which indicates the impact of improved production, protection and post-harvest technologies.
- The cost of cultivation has been reduced to the tune of Rs.10000/ha due to use of weed management (Nail weeder) and post-harvest technologies (CRIJAF SONA).
- Production of quality seed of newly developed jute varieties and their demand driven supply have improved the variety replacement upto 50%.



Productivity (q/ha) of jute

Breeder seed indent (q/ha)

TRADEMARK

A trademark of "CRIJAF SEED" has been registered with the registration no. 1893231 on 08.12.2009 and jute seeds are sold to farmers using the trademark "CRIJAF SEED" started

TECHNOLOGY COMMERCIALIZED

An improved seed sowing machine (Multi-row Seed Drill)	M/s. Mettle Engineering, Howrah
Nail Weeder	M/s. Creative Displayers, Kolkata and Krishi Udyog, Howrah
An improved herbicide applicator (Herbicide Brush)	M/s. Creative Displayers, Kolkata and Krishi Udyog, Howrah
A microbial consortium (CRIJAF SONA) used in faster retting	West Bengal Pharmaceutical and Phytochemical Development Corporation Ltd. (WBPPDCL), Kolkata
CRIJAF ramie and sisal fibre extractor	M/s. Akriti, Sambalpur, Odisha

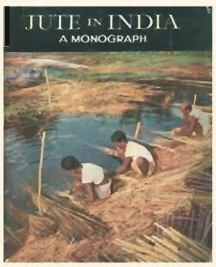
Seed Drill

Nail Weeder

Ramie and Sisal fibre extractor

CRIJAF SONA

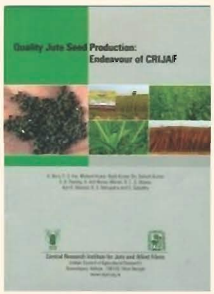
IMPORTANT PUBLICATIONS



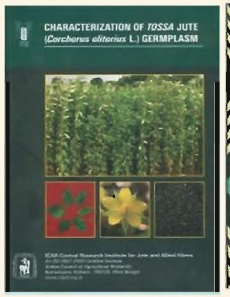
Jute in India, 1959

Pat Krishi Gabesana O Prayog, 1999

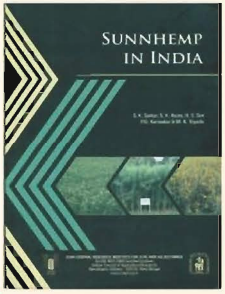
Jute and Allied Fibres Updates, 2008



Quality Jute Seed Production: Endeavour of CRIJAF, 2013



Characterization of Tossa Jute, 2015



Sunnhemp in India, 2015

IMPORTANT EVENTS ORGANISED

- International Symposium on "*Jute and Allied Fibres Production, Utilization and Marketing*" during 9 to 12 Jan., 2008, Kolkata
- National Seminar on "*Jute and Allied Fibres in Changing Times : Issues and Strategies*" during January 3-5, 2013 in collaboration with ICAR-NIRJAFT and NJB, Kolkata
- International Conference on Natural Fibres during August 1-3, 2014 in collaboration with ICAR-NIRJAFT & NJB, Kolkata
- International collection of germplasm -1987-93

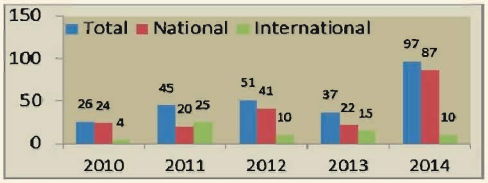
SERVICES

- Provide advisory services in jute and allied fibre agriculture to all stakeholders
- Extending soil testing facilities for preparation of SOIL HEALTH CARD
- Provide research facilities for PG research students.

Distribution of SOIL HEALTH CARD

- As National Active Germplasm Centre (NAGC) sharing of jute and allied fibre germplasm for research and academic use
- Sharing the meteorological data with different users

RESEARCH PUBLICATIONS



LINKAGE

To foster research, development and education CRIJAF has established strong linkage with ICAR-NIRJAFT, IJSG, Dhaka, NBPGR, NRCPB, DBT, New Delhi, CU, Kolkata, Presidency University, SAUs, Jute Commissioner, National Jute Board, Kolkata, IJIRA, DJD & RKMU, Kolkata, IMD, Pune, BARC, Mumbai.

FUTURE THRUST

- 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

RECOGNITION

The Council has selected ICAR-CRIJAF as regional office of National Agricultural Education Accreditation Board for Eastern and North Eastern Region.

Result Framework Document (RFD)

Year	Score	Grade
2011 -12	75.20	Fair
2012 -13	89.00	Very good
2013 -14	97.50	Excellent
2014 -15	98.15	Excellent

MILESTONES

- Transfer of premature flowering resistance trait from 'Sudan Green' to Olitorius jute lead to development of epoch-making short duration high yielding premature flowering resistant varieties which replaced about 90% of Capsularis area and increased the national yield from 11qha^{-1} (1960s) to 25qha^{-1} (2015).
- The JRO and JRC varieties released by the institute are cultivated in 95% of jute area in the country. Besides, these varieties are grown in sizable area in Bangladesh and Nepal.
- "CRIJAF SONA" - a microbial retting consortium has been found to be a successful technology for jute retting available for farmer through commercialization.

ACKNOWLEDGEMENT

The contribution of scientists whose findings are reflected in this profile are duly acknowledged

COMPILED BY

Dr. S. K. Sarkar, Pr. Scientist & I/C, PME Cell
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