National Institute of Research on Jute & Allied Fibre Technology

(Indian Council of Agricultural Research)

Annual Report

2013–14

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2013-2014

NATIONAL INSTITUTE OF RESEARCH
ON JUTE AND ALLIED FIBRE TECHNOLOGY
(An ISO 9001:2008 Certified Institute)
Indian Council of Agricultural Research
12, Regent Park, Kolkata 700 040, India

NATIONAL INSTITUTE OF RESEARCH ON JUTE & ALLIED FIBRE TECHNOLOGY
12, Regent Park
Kolkata 700 040 India

Phone 2471 1807 (Director)
2421 2115/6/7 (EPBX)
Gram JUTLAB
Fax 91 33 2471 2583
E-mail nirjaft@vsnl.net
Website www.nirjaft.res.in

Published by
Dr Debasis Nag
Director

Cover Design & Photography
Shri Kaushik Mitra

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6A S. N. Banerjee Road, Kolkata - 700 013
Ph. : 2265 0018, Fax : 2217 8116

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Foreword

Production is meaningless if it is not supported by demand and going against this economics' basic tenet invites industrial loss. For the last three months, there was no government supply order forthcoming to the jute mills in West Bengal. As a result, losses jumped over and above the threshold value in about all the jute mills, which was evident from the closure of 8 jute mills in March-April. Moreover, State Govt. also didn't want the mills to be closed in the face of impending Loksabha Elections. Hence, the mill owners were forced to reopen the closed mills with the active intervention of Labour Deptt. The present situation - the jute mills are principally thriving on Central Government quota as every year, Govt. procures gunny bags for storage of food grains. Based on statewise demand, the estimated requirement for one year is sent to Jute Commissioner's Office located at Kolkata. As per the estimate, Jute Commissioner's Office places supply order with different jute mills every month, which is termed as Production Control Order (PCO). As there was no demand in March and April, production stock was piling up in the mill godown without any supply.

According to Jute Commissioner, the jute mills in West Bengal can manufacture 3 lakh bales of gunny bags every month. Against this, supply order was placed for only 1 lakh 57 bales in the last two months of March and April. But, in the month of April alone, only 10 thousand bales' order was received by jute mills. The quota of procurement for the whole year was placed in advance in the interest of jute mills which was supplied by February itself. So, there was no scope of placement of additional order again. To ward off this precarious situation and to keep the mills running, jute mill owners demand that the State Govt. should come forward to create a market of jute diversified products and alongside Central Govt. also should procure jute based products.

It is to be borne in mind that considerable emphasis is being paid since long to the production of several non-traditional products like jute diversified products (JDP) made wholly or partially from jute fibre which has important ramifications for the industry. The yarns used in such application are generally finer in count and considerably better in quality than those used for manufacture of traditional products. The real future of jute, however, lies in the area of technical textiles be it geo-textiles or agro-textiles. Some on-going and completed projects undertaken by NIRJAFT have encouraged diversified use of jute and generated the hope of creativity and sustainable employment opportunities. The new technologies would, however, need to adhere to capital investment which the existing jute mills are unwilling to incur. Now, it is the time for revert to sustain with modernization again, which the mills can no longer disregard and discourage under the present circumstance, otherwise they will be the worst sufferers in the years to come.

(Dr. Debasis Nag)
Director, NIRJAFT

Summary

Keeping in view of the mandate and social perspective of jute and allied fibre sector, the institute has taken timely initiative for its research and development (R & D) activities in the areas of : (i) Extraction & quality improvement of fibre & evaluation of fibre properties; (ii) Development of technologies for diversification of jute products; (iii) Development of diversified value added products; (iv) Utilization of agricultural resources of jute & allied fibres for conservation of energy & preparation of value added products and (v) Transfer of technology.

The R & D activities of the institute during the period under report i.e. 2013-14 comprised of (i) Standardization of fungal retting by dry fermentation procedure for water economy; (ii) Development of a user-friendly jute grading system; (iii) Development of technology for extraction and characterization of useful phyto-chemicals from jute (*Corchorus sp.*) and dhaincha (*Sesbania sp.*) seeds; (iv) Online moisture measurement system for lignocellulosic fibre processing system; (v) Environmental impact analysis of jute and jute products in view of carbon balance; (vi) Development of an extractor to produce good quality banana fibre for textile use; (vii) Design and development of a commercial extractor for PALF; (viii) Development, application and techno-economic analysis of crop specific agro-textiles; (ix) Development of electronic colour and lustre meter for jute and mesta fibre (x) Enhancing the figuring capacity of developed handloom and study of its weaving performance for speciality fabric production and product development therefrom; (xi) Processing of natural fibres like banana and linseed in jute spinning system and development of value added products; (xii) Study on bending, frictional and electrical behavior of jute materials; (xiii) Improved processing technologies for value added diversified products; (xiv) Development of suitable expert system for analysis of defects of jute fabrics during inspection; (xv) Application of enzymes for making pulp and paper with improved characteristics using different lignocellulosic fibre; (xvi) Development of bio-adhesives for the use of agricultural residues (cassava stalk, coconut stem) in preparation of particle board; (xvii) Functional finishing of jute textile by suitable nano-particles; (xviii) Studies on techno-economic constraints and opportunity of jute diversified products manufacturing; (xix) Development of electronic and microprocessor based integrated instrumentation for jute grading system; (xx) Design & development of computerized instrument for testing bending behaviour of semi-rigid fabrics with special reference to technical textiles; (xxi) Development of an efficient staple yarn characterization unit with multi sensor fusion and field programmable gate array (FPGA) based data reduction card; (xxii) Evaluation and demonstration of NIRJAFT high capacity power ribboner for extraction of ribbons from jute and mesta plants; (xxiii) Jute based bio-composites for industry; (xxiv) Understanding and biosynthesis of gum in ramie (*Boehmeria nivea L. Gaud.*) For developing low-

gum genotypes; (xxv) Zonal Technology Management And Business Planning And Development (BPD) Unit at NIRJAFT, Kolkata; (xxvi) Value chain on coconut fibre and its byproducts: Manufacture of diversified products of higher value and better marketability to enhance the economic returns of farmer, (xxvii) Sustainable rural livelihood empowerment project for Northern disadvantaged districts of West Bengal and (xxviii) Strengthening of digital library and information management under NARS (e-GRANTH).

Design, Development and Maintenance (DDM) Section fabricated and supplied seven (7) grading instruments e.g. four Airflow Fineness Tester and three Bundle Strength Tester to different organizations as per indents received from them.

The institute signed nine MoUs and three MoAs with different entrepreneurs. Six technologies were transferred to the entrepreneurs. The technologies are i) Jute based handmade paper; ii) Designer jute bags; iii) Jute based decorative fabrics for commercial use; iv) Jute based decorative yarn; v) Jute based decorative handloom fabric for dress materials and vi) Jute stick particle board.

One Patent entitled "A particle board from date palm leaves and method of preparing the same" has been granted by the Controller General of Patent, Design & Trade Marks on 9th. Oct., 2013.

NIRJAFT organized eighteen (18) In-house Seminars by its scientists and technical officers, the topics were mainly concerned with research projects, training programmes attended, patents filed, seminar topics presented etc.

1st C R Nodder (first pre-independence Director) Memorial Lecture was organized on 1st October, 2013. Dr Prabal Ranjan Roy, Former Chief Executive (Textile), M/s Arvind Mills Ltd., Ahmedabad, Gujrat delivered his lecture about the growth of the fibre processing industry, the challenges faced by natural fibres including jute in the face of stiff competition posed by synthetics and strategies which could lead to futher growth of natural fibres.

NIRJAFT observed its 76th Foundation Day on 3rd January, 2014. On this occasion, Dr B C Mitra, Former Director and Former RAC Chairman of NIRJAFT delivered Foundation Day Lecture. In his address, he stressed upon research in the field of application of nano-technology, bio-technology and eco-friendly modification of jute for making it superabsorbent. On the same day 3rd Dr P B Sarkar (1st. Director in post-independent India) Memorial Lecture was also organized. Dr D Chakraborty, Professor, Department of Polymer Science & Technology, University of Calcutta delivered the lecture. On the eve of this memorial lecture, a book entitled "Glimpses of Life and Research Work of Dr P B Sarkar" was released by the Speaker.

A brain storming session was organized in the institute on "User-friendly jute grading system following which a Task Force under the chairmanship of Director, NIRJAFT was formed by Jute Commissioner

to evolve a user friendly jute grading system for adoption and subsequent implementation by Bureau of Indian Standards (BIS).

New Research Advisory Committee (RAC) has been formed by ICAR with effect from 23-11-2013 under the Chairmanship of Dr S Sreenivasan, Former Director, CIRCOT (ICAR), Mumbai. New Institute Management Committee (IMC) has also been formed.

Dr Debasis Nag, Head, Transfer of Technology Division took over the charge of Director of this institute on 22-04-2013 after superannuation of Dr K K Satapathy, Former Director.

The Institute

NIRJAFT is committed to pursuit of research and knowledge transfer and is engaged in technology transfer and economic development activities that benefit local, regional and national constituents. The Indian Central Jute Committee was constituted by the Government of India on the recommendation of the Royal Commission on Agriculture in 1936 to set up Jute Technological Research Laboratory in Calcutta. The institute was officially inaugurated on January 3, 1939 by Lord Linlithgow, the then Viceroy and Governor-General of India. In 1965, it became a constituent unit under the centralized administrative control of the Indian Council of Agricultural Research. The institute has been rechristened as National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT) to carries out basic and technological research on jute and allied fibres such as mesta, linseed/flax, sisal, ramie, banana, sunnhemp, pineapple leaf fibre, dhaincha, and to some extent on coconut fibre also.

The R&D programme of the institute is implemented through the following four full-fledged divisions and some sections:

Quality Evaluation and Improvement Division: The key areas of this division are extraction of jute and allied fibres, upgradation of fibre quality, production of good quality fibres, determination of physico-chemical propertie, chemical modifications of jute and allied fibres for diversified uses, development and maintenance of culture bank, and extraction of useful chemicals from agricultural byproducts.

Mechanical Processing Division: The division carries out basic and applied research on production of good quality yarns and fabrics, application of natural fibres as geo-textile and agro-textile in woven and nonwoven form, design and development of efficient machinery and jute diversified products for small and large entrepreneurs and industries.

Chemical and Biochemical Processing Division: It is working in five broad areas — pulp and paper; bleaching, dyeing and finishing; particle and fibre board; composites; and biomass utilization.

Transfer of Technology Division: The mandate of the division is to transfer institute's technologies through training and capacity building, entrepreneurship development, front line demonstration, participation in exhibitions, trade fairs, expos, melas etc.

Some Service Sections which render specialized services are Design, Development and Maintenance (DDM), Agricultural Knowledge Management Unit (AKMU), Prioritization, Monitoring and Evaluation (PME) Cell, Library, Jute Museum, Testing Section.

Priority setting, Monitoring & Evaluation Cell (PME): The research priority setting, monitoring and evaluation cell is responsible for convening meeting of the Staff Research Council, Research Advisory Committee, Lectures and for compiling and printing the quarterly, half-yearly and annual technical reports, brochures and newsletters of the institute. This unit also coordinates in speedy reply

of technical inquiries from the council as well as Parliament questions from time to time. The PME helps the director in designing and monitoring the R&D programs of the institute.

Design, Development and Maintenance (DDM): This section carries out research work in the field of mechanical design and development of prototype machinery, equipment, instruments etc. along with usual maintenance of the laboratories, infrastructural facilities, and other building and structures in the campus.

Agricultural Knowledge Management Unit (AKMU): The institute has set up an ARIS cell AKMU unit to facilitate storage and exchange of research information with other organizations. Along with this Local Area Network (LAN) has also been installed.

Library: Commensurate with the overall growth of the institute, the library too has kept a steady pace of expansion in respect of acquisition of up-to-date literature and modernization of facilities. **Apart from maintaining a large number of books, journals, reports, reprints, pamphlets, the library has developed suitable infrastructure for computerized operation. A database on JAF has been developed to store information relating to jute & allied fibres. It is also regularly publishing JAF bulletins for circulation to all research divisions. For serial control the library section has also developed a model database on CDS/ISIS of UNESCO over Common Communication Format (CCF) with necessary modifications. The database can accommodate the back volumes as well as current journals. It is expected to serve the requirement of libraries of other ICAR institutes.**

Mandate

- To carry out basic and technological research on jute and allied fibres.
- To promote production of good quality fibres.
- To upgrade the fibre and the product quality.
- To find diversified uses of plant fibres, their agricultural by-products and industrial wastes in large scale and decentralized sectors.
- To act as a repository of scientific and technological information on jute and allied fibres.
- To act as a centre of human resource development in relation to jute & allied fibres and establish linkages among different scientific and industrial organizations through exchange of scientific and technological knowledge.

Staff position as on 31.03.2014

Category	Sanctioned posts	Posts filled	Posts vacant
RMP	01	01	00
Scientific	44	19	25
Technical	60	44	16
Administrative	35	24	11
Supporting	41	30	11
Auxiliary	04	04	00
Total	185	122	63

A Glance at Nirjaft

➢ New Product/Process developed

- NIRJAFT was awarded an ISO: 9001-2008 certificate by M/s Vexil Business Process Services Pvt. Ltd with effect from 28th December, 2013 under the scope of 'Research and Development, Training, Testing, Advisory and Extension Services on Jute and Allied Fibres' for a period of 3 years.

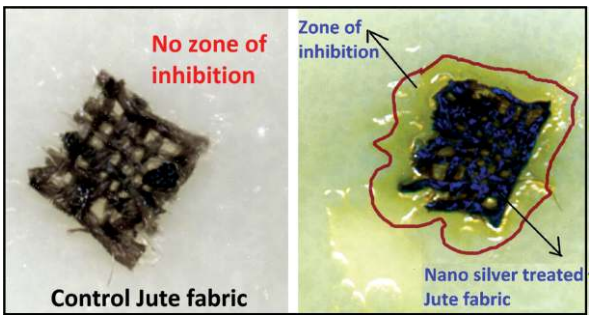
- Particle boards were developed from cassava stalks using soya protein powder as bio-adhesive.

Particle Board from Cassava Stalk

- A close weave jute fabric in the tune of 100 m^2 suitable for rubber coating has been developed.

- Development of jute fibre based fancy leno fabric for making disposable carry bags: 100% jute open mesh fabric of three different mesh sizes and basis weights (190, 225, & 270 g/ m^2) were developed from 10 lb jute yarn using jute in both warp and weft for producing disposable carry bags of different holding capacities.

- Knitted fashion fabric has been developed from blends of jute-cotton blended core-sheath yarn.
- An instrument has been developed for electrical insulation testing of textile in transverse direction. With this instrument, insulation of jute canvass, hessian and nonwoven of different g/m^2 can be tested smoothly.
- An alternative use of non-viable jute seed oil as jute batching oil has been standardized. The jute seed oil has been applied in jute fibre processing industry instead of hydro carbon containing jute batching oil sample.
- Nano silver treated jute with high antibacterial property has been developed.



- Technology for producing paper of superior quality, based on pre-treatment of jute with enzymes, has been developed.

➢ **Publication:** The institute published twenty scientific papers in different reputed journals.

➢ **Program Organized :**

- In-house seminar - Fifteen numbers by Institute scientists

- An one-day workshop on theme "*Library automation: Impact on dissemination of scholarly output of a R & D organization*" organized by Library, NIRJAFT held on November 28, 2013 in Institute auditorium
- NIRJAFT Recreation Club organized a cultural programme on 14th August, 2013 i.e. on the eve of Independence Day in NIRJAFT auditorium. Staff members and their families participated in the Flag Hoisting ceremony on 15th August, 2013 chaired by Director and also participated in a small cultural programme
- The first interaction meeting between ZTM-BPD Officials of NIRJAFT and the Clients of Business Incubation Centre, NIRJAFT was organized on 14th May 2013 at the Committee Room of NIRJAFT
- A one day Agri-Business Camp was organized by ZTM-BPD Unit of NIRJAFT, Kolkata in association with National Research Centre for Orchids, Pakyong, Sikkim at Chintan Bhavan, Gangtok on June 24, 2013
- A one day Agri-Business Camp was organized by ZTM-BPD Unit of NIRJAFT, Kolkata in association with CARI, Port Blair, Andaman & Nicobar Islands on July 27, 2013 at the Conference Hall of CARI, Port Blair.

➢ Training /Demonstration/Transfer of Technology/Human Resource Development

- A National Level Training Programme on *Value addition in jute and allied fibres through post harvest processing*, sponsored by Ministry of Agriculture, under Mini Mission-II of Jute Technology Mission, was held at NIRJAFT, Kolkata during April 16-20 , 2013
- A training programme on "Advances in Improved Production Technology and Fibre Quality Assessment of Jute & Allied Fibre Crops" was organized by CRIJAF and NIRJAFT jointly from 24th to 29th June, 2013 for the scientists working in different AINP centres as well as co-ordination centre at CRIJAF.
- An Awareness Workshop on NFBSFARA was organized at NIRJAFT on 23rd and 24th of August, 2013

- A training program on Weaving of jute-cotton doormat in handloom' under NAIP component III was organized by NIRJAFT at Pulintala Village, Malda District, West Bengal during Sept. 14-28 , 2013
- Field demonstration on fungal dry retting of jute was conducted at different jute growing districts of West Bengal
- Training on Weaving of Cotton Towel in Handloom under NAIP component III was conducted at Bhimtala Village, Malda District, West Bengal on Nov. 15-29, 2013
- A six days training program on Jute Handicraft by ZTM-BPD Unit was organized at NIRJAFT for 15 unemployed youth during Dec. 2-7, 2013.
- Training program on Jute Ornaments was organized for 15 unemployed rural youth at NIRJAFT during Jan. 20-25, 2014.
- Training on Jute Bag to 15 fervent unemployed youth organized at NIRJAFT on Feb. 10-22, 2014.
- Comprehensive Hindi training program on Praveen and Pragya was organized from Feb.11 to April 02, 2014

➢ **Resource Generation/ Consultancy**

• Sale of farm produce goods	Rs. 43466/-
• Sale of vehicles, other machine tools	Rs. 511817/-
• Analytical testing fee	Rs. 397500/-
• Income generated from training	Rs. 139200/-
• Sale of technology	Rs. 24020/-
• Sale of retting chemicals	Rs. 462944/-
• Repair of equipment	Rs. 53000/-

➢ **MOU signed:** Nine

➢ **Instrument/ equipment fabricated under DDM Section**

- Airflow Fineness Tester - 4
- Bundle Strength Tester - 3

➢ **Instruments Procured:** i) Laboratory Fermentor, ii) Vacuum Rotary Evaporator, iii) UV Spectro Photometer, iv) BOD Incubator Shaker, v) Vertical Autoclave (sterilizer)

➢ **Infrastructural Development :**

- Renovation of Canteen
- New room for Medical Officer
- Cashier room
- The Indian Natural Fibre Society
- Recreation Club
- Security Staff room and IJC room

Research Accomplishments

Quality Evaluation and Improvement Division

Achievements

- Fungal retting by dry fermentation procedure has been standardized on the basis of fibre qualities, yarn processing and yarn qualities. This is an effective technology in water crisis
- An user friendly jute grading system has been developed which will be beneficial for all stake holders
- Technology has been developed for extraction and characterization of useful phytochemicals from jute and dhaincha
- An online moisture measurement system has been developed suitable for carding machine of jute processing
- Carbon balance of complete life cycle of heavy duty jute shopping bag is +2.352t CO_2. It is concluded that dry retting technology is the only solution for the natural jute fibre to be carbon negative
- Two separate extractors have been developed to get textile grade banana and PALF fibre

QEI 4 Standardization of fungal dry retting by dry fermentation procedure for water Economy

Dr. S. Banik and Smt. R. Nandi.

An attempt has been taken to establish the technology of fungal dry retting of jute which can really solve the present prevailing water crisis situation for retting of jute. If this technology is successful, the jute farmers will be highly benefitted.

Four fungal cultures namely *Aspergillus tamarii*, *Aspergillus flavus*, *Aspergillus niger* and *Sporotrichum thermophile* were selected for conducting fungal dry retting of jute. These fungi were maintained in laboratory and mother cultures were developed in PDA (Potato Dextrose Agar) medium. The fungi were inoculated on a solid base of rice husk and wheat bran and allowed to grow by solid state fermentation method for field trials.

Four fungal dry retting field trials cum demonstrations were conducted at sites 1) Amta block I, Howrah, 2) Babpur, 24 paraganas (North), 3) Sargachi, Murshidabad and 4) NIRJAFT, Kolkata with 90,100,110 and 120 days old green jute whole plant. Farmers' training was also conducted for their awareness on the new technology. The fungal dry retted jute fibre samples were collected for evaluation of fibre and yarn quality and their grading.

Four fungal cultures viz., *Aspergillus tamarii*, *Aspergillus flavus*, *Aspergillus niger* and *Sporotrichum thermophile*, used for fungal dry retting of jute. Earlier they were maintained in laboratory by periodic transfer into fresh nutrient medium (Potato Dextrose Agar) to keep them alive and active for next year.

Fibre samples obtained by dry retting of jute from different centres have been evaluated for fibre strength, fibre fineness and fibre grading (Table 1). Results indicated that the fibre has reasonable good strength and fineness and their grade varied between TD-5 to TD-4.

8 lb yarns have been prepared successfully from dry fungal retted jute samples. The results of yarn testing have been presented in Table 2. The yarn strength, irregularity, twist per inch, and work of rupture parameters confirm the regularity of the yarns.

Effect of inoculation of the fungi on rice seed germination and on the dry matter synthesis (growth) of rice plants were conducted to determine the bio-safety effect of the fungi used for dry retting of jute. The results presented in Table 3 indicate that all the fungi had more or less stimulating effect instead of any harmful effect on plants.

Farmers training on fungal dry retting of jute

Demonstration of fungal dry retting of jute to farmers

Extraction of jute fibre after fungal dry retting

Table 1 - Evaluation of fibre quality obtained from dry retting trial at farmers field

	Fungal treatment	Time of retting, days	Root content, %	Fibre strength g/tex	Fibre fine-ness tex	Fibre grade
Field I	F-1, *Aspergillus tamarii*	15	5	19.8	2.8	TD-5, 20% up
	F-2, *Aspergillus flavus*	15	8	26.2	2.8	TD-5, 60% up
	F-4, *Aspergillus niger*	15	8	27.7	2.9	TD-5, 30% up
	S-1, *Sporotrichum thermophile*	15	8	25.0	2.9	TD-5, 25% up
	Control C, Water retting	18	10	22	3.1	TD-5
Field II	F-1, *Aspergill us tamarii*	10	10	24.8	2.9	TD-5, 80% up
	F-2, *Aspergillus flavus*	10	10	23.9	2.9	TD-5
	F-4, *Aspergillus niger*	8	8	20.5	2.9	TD-5, 80% up
	S-1, *Sporotrichum thermophile*	8	8	23.7	3.0	TD-5, 45% up
Field III	F-1, *Aspergillus tamarii*	5	5	17.5	2.8	TD-5, 10% up
	F-2, *Aspergillus flavus*	8	8	20.8	2.8	TD-5, 60% up
	F-4, *Aspergillus niger*	8	8	20.7	2.9	TD-5
	S-1, *Sporotrichum thermophile*	8	8	20.6	2.9	TD-5, 70% up
Field IV	F-1, *Aspergillus tamarii*	8	8	20.3	2.8	TD-5, 65% up
	F-2, *Aspergillus flavus*	5	5	16.9	2.8	TD-6, 40% up
	F-4, *Aspergillus niger*	10	10	17.6	2.9	TD-5
	S-1, *Sporotrichum thermophile*	5	5	20.5	3.0	TD-5, 80% up

Table 2 - Yarn character of fungal dry retted jute fibre

Year	Fungal treatment	Maximum load N	Tensile elongation	at break Tenacity CN/tex	Initial modulus CN/tex	Work of rupture mJ/tex M	Average relative resistance index	Um (%)	Thick place (per Km)	Thin place (per Km)	Hairiness index
2012	F-1, *Aspergillus tamarii*	29.08 (19.49)*	2.04 (13.08)	9.91 (19.49)	202.31 (27.54)	0.83 (30.44)	2807.72	24.79	2334	1550	13.07
	F-2, *Aspergillus flavus*	31.28 (23.24)	1.97 (18.89)	10.67 (23.24)	237.60 (31.18)	0.86 (37.18)	3654.65	24.46	22.32	1436	11.90
	F-4, *Aspergillus niger*	30.84 (20.49)	2.25 (13.27)	10.52 (20.49)	194.05 (21.35)	0.96 (30.62)	3573.97	25.72	2596	1564	11.28
	S-1, *Sporotrichum thermophile*	31.09 (20.02)	2.48 (12.96)	10.60 (20.02)	112.75 (28.94)	1.00 (31.45)	3378.99	27.80	3246	1874	12.48

*Figures in the parentheses indicate the CV% values

Table 3 - Effect of inoculation of the test fungi on seed germination and plant dry weight of rice

Fungal treatment	Rice seed germination %	Increase over control %	Rice plant dry weight g	Increase over control %
Uninoculated control	33	-	279.0	-
F-1, *Aspergillus tamarii*	47	42.4	410.1	47.0
F-2, *Aspergil lus flavus*	48	45.5	422.5	51.4
F-4, *Aspergillus niger*	37	12.1	560.7	100.9
S-1, *Sporotrichum thermophile*	50	51.5	588.2	110.8

Fungal dry retted jute fibres washed for cleaning

Table 4 - Yarn character of fungal dry retted jute fibre (Year 2013)

Year	Fungal treatment	Maximum load N	Tensile elongation at break %	Tenacity cN/tex	Initial modulus cN/tex	Work of rupture mJ/tex m	Relative resistance index
2013	F-1, *Aspergillus tamarii*	26.20 (27.51)	1.90 (20.45)	9.49 (27.51)	337.43 (15.92)	0.82 (45.86)	3323.27
	F-2, *Aspergillus flavus*	27.60 (19.89)	1.71 (14.78)	10.00 (19.89)	392.18 (14.72)	0.76 (30.82)	2630.17
	F-4, *Aspergillus niger*	27.98 (24.71)	1.79 (18.15)	10.14 (24.71)	396.18 (15.16)	0.82 (39.38)	3323.27
	S-1, *Sporotrichum thermophile*	35.94 (27.40)	1.92 (18.25)	13.02 (27.41)	450.34 (13.03)	1.13 (41.60)	2744.67

*Figures in the parentheses indicate the CV% values

Advantage of dry retting over conventional retting technology

- The main advantage of fungal dry retting is water economy, the need of the hour
- Fungal dry retting is an aerobic process, not producing offensive smelling gas and methane.
- It controls breeding of mosquitoes.
- It does not produce water and aerial pollution.
- Fungal retting is faster and it produces good quality fibre.
- It is an effective tool for fighting against anthropogenic factors responsible for global warming. Jute product manufacturers can even get carbon credit by adopting this technology.
- Active support from the Government is needed for implementing this breakthrough technology for the jute farmers.

QEI 7 User-friendly Jute grading System

Dr. S. C. Saha, Dr. U. Sen & Shri A. Ghosh

Raw jute grading system was formulated to ensure remunerative prices to the growers as well as to meet the jute mills' requirement. But in the commercial transaction, subjective assessment i.e., "Hand & Eye Method" is still in practice instead of objective assessment. In the recent times, diversified uses of jute e.g. geo-textiles, technical textiles, home textiles, agro-textiles, pulp & paper etc. have emerged in a big way and there is a need of quality jute fibre which is performance specific. Quality of jute fibre is not universally uniform. It varies from place to place according to the nature of soil, weather conditions, type of water used for retting etc. Due to lack of uniformity in quality, grading of the fibre assumes importance for commercial purposes.

Existing grades and physical parameters

- There are 8 (eight) grades
- 6 (six) physical parameters (strength, root content, defects, fineness, colour & bulk density) are considered
- Each physical parameter has several sub-groups
- Total 100 marks have been distributed among the 6 physical parameters
- There are 15 marks difference between the grades.

Drawbacks in the existing grading system

- Grade-1 & 2 do not exist in reality

- 6 (six) parameters are not considered for 8 (eight) grades
- Several sub-groups for each parameter
- One sub-group is overlapping with the adjacent one
- Some sub-groups are confusing
- Mark allocation between the sub-groups is not appropriate
- For grade-1 to grade-4, only 6 (six) physical parameters are considered
- For grade-5 only 5 (five) parameters are considered without assigning any condition
- For grade-6 and grade-7 only 3 (three) parameters are considered without assigning any reason

Proposed user-friendly jute grading System

To prepare the user-friendly jute grading system some significant steps are followed. To get relative importance of different physical parameters for the proposed jute grading system feed back from farmers (150 number), mill personnel (25 number) followed by several brain storming sessions and analysis of comparative grading systems followed by different jute growing countries were taken into account. Samples of different Indian states were tested for different parameters by existing grading system. All the accumulated data were analyzed thoroughly in the several task force meetings. It has been resolved that grades and sub-groups of each parameter are to be reviewed. Simultaneously parameters are to be minimized with emphasis on defects, strength, root content. Bulk density as a parameter has a close linkage with fineness and strength (based on correlation study) and hence can be omitted. Based on relative importance of parameters score weightage were redistributed. It is also resolved that all parameters assigned are to be considered for all proposed grades, which was not followed in existing grading system. It is further opined that the grades proposed would help to minimize subjective assessment (prone to under estimate / over estimate), quality based price fixation for both farmers as well jute mills to develop quality product. The proposed grading system would strengthen the much needed estimates to cope up with changing global scenario of jute sector where more multidimensional applications are now being encouraged.

Essential features of proposed grading system

The following important salient points are:

- 6 (six) grades effectively 5 (five) grades instead of existing 8 (eight) grades
- 5 (five) physical parameters are considered instead of existing 6 (six) physical parameters
- All the parameters are considered for all the grades
- Sub-groups have been reduced for each parameter
- Total scores 100

Score marks distribution:

Strength	Excellent (30)	Good(23)	Average (13)	Poor (04)
Defect	Excellent (25)	Good (17)	Average (09)	Poor (05)
Root content	Excellent (20)	Good (15)	Average (08)	Poor (03)
Fineness	Very Fine (15)	Fine (10)	Coarse (05)	-
Colour	Good (10)	Average (05)	Poor (03)	-

Table 1 - Proposed Score for "Hand & Eye" Method Grading

Grade	Strength	Defects	Root content	Fineness	Colour	Total Score
TD-1	Need strength to break the fibre and sharp audible sound at the time of breakage (**Excellent 30**)	Free from major defects but 10% minor defects may be allowed **(25)**	< 5% length wise **(20)**	Very Fine **(15)**	Light creamy to reddish yellow with lustre **(10)**	100
TD-2	Need less strength to break the fibre and sound will be available at the time of breakage **(Good 23)**	90% free from major defects but 20% minor defects may be allowed **(17)**	> 05%- 8% length wise **(15)**	Very Fine **(15)**	Light creamy to reddish yellow with lustre **(10)**	80
TD-3	Need less strength to break the fibre and sound will be available at the time of breakage **(Good 23)**	80% free from major defects and 30% minor defects may be allowed **(09)**	> 08%- 10% length wise **(08)**	Fine **(10)**	Light creamy to reddish yellow with lustre **(10)**	60
TD-4	Need less strength to break the fibre and feeble sound at the time of breakage **(Average 13)**	80% free from major defects and 30% minor defects may be allowed **(09)**	> 08%- 10% length wise **(08)**	Coarse **(05)**	Reddish / brownish with some light grey **(05)**	40
TD-5	Easily break the fibre and no sound at the time of breakage **(Poor 04)**	70% free from major defects **(05)**	> 10% length wise **(03)**	Coarse **(05)**	Light grey to dark grey **(03)**	20
TD-6	Entangled or any other jute not suitable for any of the above grades but of commercial value					

Table 2 - Proposed Score & Value for Instrumental Grading

Grade	Strength (gm/tex)	Defects (Wt. %)	Root content (L %)	Fineness (tex)	Colour (w.r.t. white%)	Total Score
TD-1	Excellent **30** (=25)	(0.5) **25**	(< 05) **20**	Very Fine **15** (=2)	Good **10** (=65)	100
TD-2	Good **23** (< 25 20)	(1.0) **17**	(05 - <08) **15**	Very Fine **15** (2)	Good **10** (65)	80
TD-3	Good **23** (< 25-20)	(1.0) **09**	(05 - <08) **08**	Fine **10** (>2-3)	Good **10** (=65)	60
TD-4	Average **13** (19.9-15)	(1.5) **09**	(08 - <10) **08**	Coarse **05** (>3)	Average **05** (64-65)	40
TD-5	Poor **04** (< 15)	(>1.5) **05**	(>10) **03**	Coarse **05** (>3)	Poor **03** (<45)	20
TD-6	Entangled or any other jute not suitable for any of the above grades but of commercial value					

Notes:

1. The minimum reed length should be 150 cm, or the effective reed length should not be less than 100 cm except for TD-6.
2. Jute should be in dry storable condition.
3. Jute should be free from HUNKA, mud and other foreign materials.
4. Natural dust may be allowed in grades TD-3 to TD-5 with proportionate discount.
5. Root content will include hard barky croppy ends.
6. A parcel of jute which would not secure full marks for a particular grade shall still be considered for that grade with suitable discount to be settled between the buyer and seller, provided its score is not less, by 50 (or more) percent of the difference, between the maximum scores for that and the next lower grade. When the score is less by 50 (or more) percent of the difference, the buyer will have option to reject or settle with a suitable discount. Scores on the table may be taken as guidance for determining the discount.
7. For instrumental determination of various characteristics like strength, defects, root content, fineness, etc, reference to the relevant part of IS 7032.

QEI 8 Development of technology for extraction and characterization of useful phytochemicals from jute (*Corchorus sp.*) and dhaincha (*Sesbania sp.*)

Dr. D.P.Ray, Shri S.B. Mondal & Shri K. Manna

Validation of solvent extraction technology for jute and dhaincha seed oil

A solvent based extraction technology has been developed for extraction of vegetable oil from waste jute and dhaincha seeds. These seeds are a potential source phytohemicals and oil. The preliminary screening with different solvents indicated that petroleum ether (40-600C) based extraction is best suited for extraction of both the oils. For validation, the shade dried seeds are crushed with seed crusher and placed in a thimble for extraction of seed oil with the help of a soxhlet apparatus. The extraction process continues till the solvent in the soxhlet turns colourless from the pale yellow colour. In the laboratory condition 500-750g seeds were treated with 1.5 litres of solvent. After extraction, the dark yellow coloured solvent is distilled to get concentrated oil. The oil yield from jute and dhaincha seeds was 12% and around 30% respectively.

Study on physico-chemical and chemical properties of jute and dhaincha seed oil

The concentrated oil extracted from jute and dhaincha seeds was taken for study of different physico-chemical parameters, like Iodine value, saponification value, moisture content, seed index, fat and wax content etc. The fatty acid contents of both the oils were evaluated.

Esterification of the Oil fraction for estimation

The seed oil obtained from jute and dhaincha seeds were esterified with methanol and sulphuric acid. For esterification process, proportionate amount of seed oil was taken in a glass vial and methanol was added to it. A few drops of sulphuric was added and kept for the reaction to occur for 6 h. After the incubation period, the esterified products were separated and purified using solvent partitioning techniques.

Gas chromatographic Mass spectrometric Analysis of esterified seed oil

The esterified seed oil was then taken for GC-MS analysis. From the GC spectra it was revealed that myristic, palmitic and stearic acids are the prevalent fatty acids in the oil fraction. In both jute and dhaincha seed oils, the linoleic acid was also present.

Preparation of conc. methanolic extract from defatted seeds

After extraction of seed oil, the defatted crushed seeds were dipped in methanol for 3-5 days for isolation of other components present in jute seed. After five days the solvent was decanted and concentrated in a distillation apparatus. The viscous solid mass obtained from the distillation was taken out and kept for drying in a desiccator for further fractionation. The yield of viscous mass obtained was 12-15%.

Column Chromatography of the methanolic extracts

The viscous mass obtained from the seed through the methanolic extraction at room temperature was then taken for rigorous column chromatography. The dry weighed sample (2g) was taken in a porcelain bowl and mixed with silica gel G to make free flowing slurry and load it over the column. A glass column was taken and filled with silica gel with chloroform and an auxiliary solvent. After filling the column, the top layer was filled with a thin layer of anhydrous sodium sulphate in addition to a layer of cotton to minimize the spillage loss.

Solvent screening

Solvents of different polarities were selected to run the column according to the polarity. The less polar solvent was run first in the sequence of their increasing polarity. The solvent run was started with 100% Hexane followed by increasing the polarity with addition to Benzene, Ethyl acetate and acetone. The final combination was made with ethyl acetate and methanol. The ratios generally followed are 95:5, 90:10, 80:20 and 70:30, 60:40 and 50:50

Collection of the elutes

The solvent alone or in combination was passed through the column and 50 ml fraction of the solvents was collected in an Erlenmeyer flask. The same solvent ratios were mixed, collected and dried out in a vacuum evaporator. The concentrated products were subjected to TLC from the same type of compound and were kept together for further analysis. The EA: MeOH = 70:30 and the EA: MeOH = 60:40 ratio showed the presence of active components in jute seed oil.

Characterization of seed oil and seed extracts

The oil extracted from jute and dhaincha seeds were subjected to IR study of the methanol extracted masses that was done to reveal the possible compounds present in it.

Application of jute seed oil as conditioning agent to substitute jute batching oil

The jute seed oil obtained from the experiment was taken for Mill trial to evaluate its performance for application as conditioning agent to substitute the jute batching oil. For comparison, jute batching oil and rice bran oil were also taken. Oil emulsion was prepared and sprayed to jute (TD 4 grade) and kept for softening and piling. The jute was processed in jute mill in MP Division. 8 and 10pounds of yarn were prepared. After that the yarn was tested in Instron. The yarn linear density cv is highest in case of JSO followed by JBO and RBO. Yarn diameter cv of JSO is closer to JBO but higher than RBO. JBO treated yarn shows better strength compared to JSO and RBO. However, extension, specific work of rupture and quality ratio of JSO treated yarn was lower compared with RBO and JBO. Yarn breakage of JSO was at par with RBO where JBO showed no yarn breakage.

Extraction technology of gum from dhaincha seeds

A novel method of dhaincha gum extraction has been standardized in our laboratory in which Dhaincha seeds were dipped into distilled water for 5 to 8 days in tray. Everyday tray water was filtered

by a cloth and taken in a separating funnel and tray was again filled by distilled water. Acetone was added to the funnel and well shaken. After few minutes dhaincha gum precipitated at the bottom of the separating funnel. Then, precipitate was collected in a centrifuge tube, centrifuged for 15 minutes at 210 rpm and the gum was collected in a watch glass and kept in an oven for 60 to 90 minutes at 110° C. Then crystalline dhaincha gum was taken in a vial and kept in a desiccator.

Fig. 1 - Extraction of dhaincha solvent gum extraction

Fig. 2 - Pure dhaincha gum from

Characterization of Dhaincha seed oil through GC-MS

The dhaincha seed oil was esterified in acidic media to form the methylated ester which was taken for GC-MS, the spectral signature of the oil indicated that the oil is rich in some common fatty acids.

FTIR study of methanol extracted compounds of Jute seed

FT- IR study of the methanol extracted masses was done to reveal the possible compounds present in it. The major peak in the FTIR was found to be 989, 1034, 1740, 2309, 2852, 2922 and 3327 cm^{-1}. The peak on 1740 cm^{-1} is due to carbonyl functional present in the seed oil, which indicates the presence of aldehyde or acid groups in the methanolic extracts. The peaks on, 2309, 2852 cm^{-1} is due to CH-stretching group. The broad peaks around 3300 cm^{-1} is due to -OH stretching absorption in the compound (Fig 3).

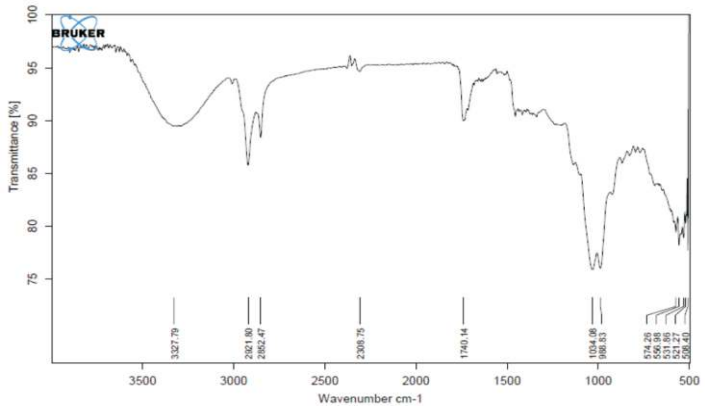


Fig. 3 - FTIR spectra of methanol extracted compounds of Jute seed

Application of jute seed oil as the conditioning agent to substitute of jute batching oil

The jute seed oil obtained from the experiment were taken for Mill trial study to evaluate its performance for its application as conditioning agent to substitute the jute batching oil. For comparison jute batching oil and rice bran oil were also taken. Oil emulsion was prepared and sprayed to jute (TD_4 grade) and kept for softening and piling. The jute was processed in jute mill in MP Division. 8 and 10 pounds of yarn were prepared. After that the yarn was tested in Instron. The yarn linear density cv is highest in case of JSO followed by JBO and RBO. Yarn diameter CV of JSO is closer to JBO but higher than RBO. JBO treated yarn shows better strength compared to JSO and RBO. However, extension, specific work of rupture and quality ratio of JSO treated yarn was lower compared with RBO and JBO. Yarn breakage of JSO was at par with RBO where JBO showed no yarn breakage (table 1).

Table 1 - Comparative effect of RBO, JBO and JSO on 8 lb yarn of jute

Property	RBO 1*	JBO 1	JSO 1
Yarn linear density, Tex (lbs/spy)	276.21 (8.02)	266.31 (7.73)	269.61 (7.83)
CV %	4.15	4.13	5.44
Yarn Diameter (mm)	2.37	2.35	2.26
CV%	22.11	26.67	27.73
Breaking load (N)	24.69	25.99	23.04
CV%	18.74	19.16	15.12
Extension (%)	1.43	1.35	1.29
CV%	14.93	16.52	13.19
Tenacity (cN/tex)	8.94	9.76	8.55
Sp.Work of rupture ($mJ/_t ex.m$)	0.229	0.235	0.198
Quality ratio (centi-spyndle)	69.00	75.56	66.13
Yarn breakage (No of breaks/spindle/h)	2	Nil	2

Table 2 - Comparative effect of RBO, JBO and JSO on 10 lb yarn of jute

Property	RBO-2**	JBO-2	JSO-2
Yarn linear density, Tex (lbs/spy)	330.33 (9.58)	318.78 (9.25)	318.70 (9.25)
CV %	2.60	3.18	2.55
Yarn Diameter (mm)	2.48	2.37	2.56
CV%	23.19	23.07	18.41
Breaking load (N)	34.31	32.71	30.73
CV%	17.86	18.04	16.30
Extension (%)	1.89	1.73	1.65
CV%	15.76	16.66	16.81
Tenacity (cN/tex)	10.39	10.26	10.01
Sp.Work of rupture (mJ/Tex.m)	0.335	0.311	0.300
Quality ratio (centi-spyndle)	80.48	80.61	77.53
Yarn breakage (No. of breaks/spindle/h)	Nil	Nil	Nil

Table 3 - Physico-Chemical properties of RBO & JSO

Physico-Chemical parameters	JSO	RBO
Unsaponifiable matter	4.3	4.2
Specific gravity	0.928	0.916
Oil yield (%)	12.8-13.2%	12-15.0%
Acid value	1.5	1.2
Iodine value	106	100
Saponification value	185	211.8

QEI 10 Online Moisture meter for Jute Processing System

Dr. G. Roy

This instrument can measure 3 parameters e.g. Relative Humidity, Moisture Content and Moisture Regain while the jute is in processing stage. A special semiconductor type sensor was prepared and fixed at the delivery end of the carding machine that captures the input data and shows in the display panel. This sensor unit can also be placed at the input/output unit of any jute processing machinery to get those 3 parameters. In case of online moisture measurement, it is a prerequisite condition that the response time has to be very very low so that it can show the reading in real time basis. So, in this case, a semiconductor type sensor was selected that can inhale the moisture content at a very fast rate and produce the result instantly.

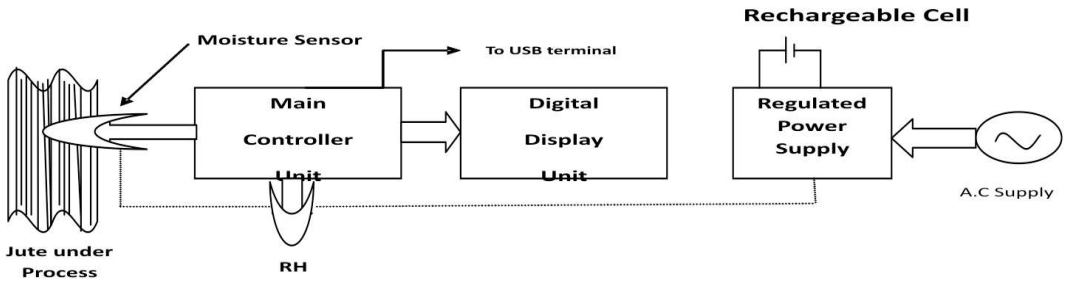
One suitable micro controller has been used to capture the input, compute the moisture content and moisture regain value and to display the same digitally using seven segment LED display.

A separate sensor of semi conductor type has also been provided with the instrument to measure the relative humidity and to display the same digitally in the same housing of the instrument.

For computer connectivity, a USB type interface has been provided and a suitable rechargeable battery has been provided with the instrument so that it can work independently for a suitable time span and with 230V, 50HZ supply.

The input sensor has been incorporated in a special type of attachment and placed with the doffer unit of the breaker card and it was found to be working satisfactorily.

The readings of the instrument were calibrated with the dry oven test and the error obtained lies within ±2%. The corresponding values are given in Table 1.



Schematic Diagram of on Line Moisture Measurement System

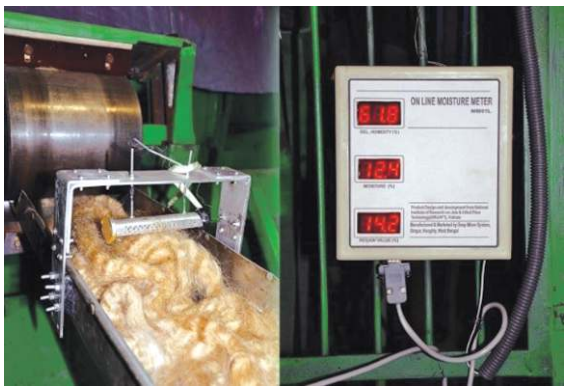


Fig. 2 - Online moisture meter with input sensor

Fig. 3 - Online moisture meter

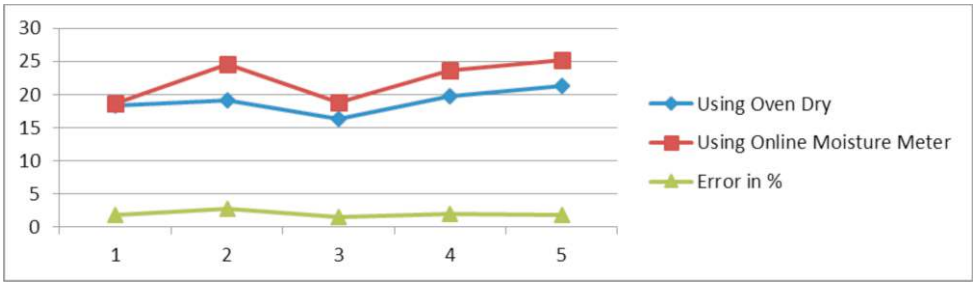


Fig. 4 - Error Graph

QEI 11 Environmental impact analysis of jute & jute products in view of carbon Balance

Dr. B.Saha and Dr. U.Sen

Life Cycle Assessment of jute and heavy-duty jute sacking bag was done in view of carbon balance. An experiment was designed in the BCKV adapted farm for taking observation of Jute crop (variety JRO 524) at 20 days interval from date after sowing (DAS) during its growing period. Conventional package of practices was followed and input-output of nutrients have been analysed. Carbon fixation during cultivation of crops has been studied. Green House Gas Emission during extraction of fibre from raw jute has been estimated. Indicators of water pollution like BOD, COD and TSS during pre-retting, retting and post-retting period have been estimated. Net carbon fixation on the basis of carbon absorption in the soil and biomass, carbon emission in the system and net carbon fixation have been estimated. Carbon emission during jute fibre processing for production of jute bag was also estimated. Salient achievements are presented through Table1, 2 and 3.

Table 1 - Per hectare CO_2 fixation and greenhouse gas emissions (kg)

Production Steps	Fixation/Emission kg/ha
CO_2 fixation during cultivation	21755(+)
CO_2 incorporation through leaves and crop residues after harvest	940(+)
CO_2 emission of retting	51 (-)
CH_4 emission of retting (CO_2 equivalent)	600 (-)
CO_2 emission from fibre	4215 (-)
CO_2 emission from stick	8389 (-)
Fertilizer, Insecticide and energy consumed (CO_2 equivalent)	900 (-)
CO_2 emission from residues	2193(-)
Total CO_2 fixation in the life cycle of Jute (upto fibre production)	6347

Table 2 - Carbon balance

Sl. No.	Process	Phase	Carbon fixed/emitted t CO_2
1.	Jute Production	I (Cradle to Gate)	**6.347**
2.	Jute processing for sacing bag	II (Gate to Gate)	**-1.77**
3.	Transport of Jute bags	III (Gate to Gate)	**-0.2**
4.	Disposal of jute bags by end users	IV (Gate to Grave)	**-2.025**
		Balance	**2.352**

Table 3 - Water Footprint (CO_2 equivalent)

Processes	Vol of water required/ Consumed l	Energy Equivalent kWh	Carbon Footprint t CO_2
Water requirement /consumption including Retting	1,93,500	15808.95	-2.055
Weighted average water consumed by fertilizer industry	1000	81.7	-0.011
Weighted average water consumed by insecticide industry	400	32.68	-0.004
Production of jute sacing bag (bleaching, cooling, JBO, chemicals)	15868.86	1296.41	-0.168
		Total	**-2.238**

Thus during the complete life cycle of heavy duty jute shopping bag, carbon balance was found to be 2.352t of CO_2. It was observed that, huge amount of water was consumed during the jute production and processing system.

Total carbon emission equivalent during the entire life cycle has been found to be 2.238t of CO_2 .On the basis of the observations, it was concluded that if the natural fibre jute has to be carbon neutral to carbon negative, alternate dry retting technology has to be developed.

QEI 12 Development of an extractor to produce good quality banana fibre for textile use

Dr. L.K. Nayak; Dr. V.B. Shambhu & Dr. S.C. Saha

An up-graded extractor was designed and fabricated with the provisions of feeding mechanism & scratched roller-guide plate clearance adjustments. Basic characteristics of the pseudo-stem processed on the fabricated extractor are

1. Average Length of whole stem: **267 cm**
2. Average Weight of whole stem: **37.5 kg**
3. Average Diameter of whole stem (Basal End): **21.3 cm**
4. Average Diameter of whole stem (Top End): **15.3 cm**
5. Average Number of sheath on whole stem: **22**
6. Average weight of sheath on whole stem: **90%**
7. Average Number of Green sheath: **4**
8. Average weight of Green sheath: **15%**
9. Average Number of White sheath: **18**
10. Average weight of White sheath: **75%**
11. Average weight of Edible Core : **10%**

After extraction of fibre by different combinations of processes, strength and fineness of the fibre was measured (Table 1.)

Table 1 - Variation in the strength & fineness of extracted fibre

Treatment/Code	Strength g/ tex	Fineness tex
Machine Extracted	22.5	3.8-7.0
Machine Extracted + Washed	15.8	4.8-8.0
Machine Extracted + Scrapped	28.7	4.5-7.5
Machine Extracted + Scrapped +Washed	19.40	4.50-8.0
Machine Extracted + Tap water retted	14.5	4.0-7.5
Machine Extracted + Chemical (*Sonali Sathi*) retted	20.5	4.0-7.0

As observed from the data on Table 1., strength & fineness of the extracted fibre was found non-uniform. Also during trial run on the modified extractor, it was found that 10-12% of the pseudo stem couldn't be processed due to manual pulling for debris removal. Further modifications (Fig. 1) of the extractor and trial run are under progress.

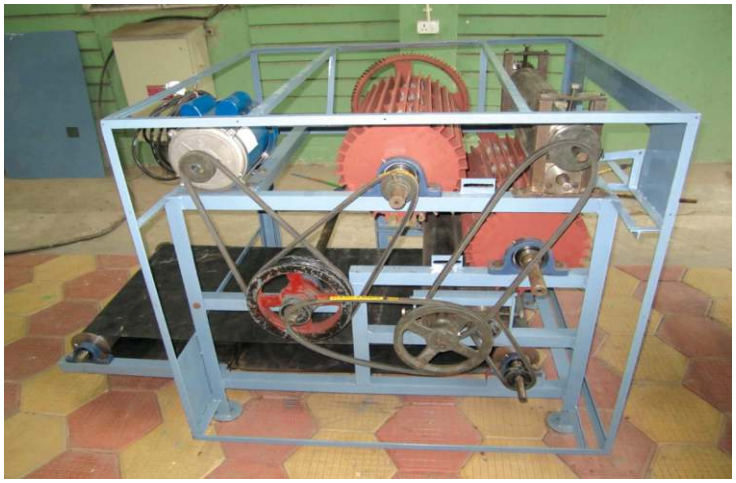


Fig. 1 - Modifications in the Banana Fiber Extractor

QEI 13 Design and Development of a commercial extractor for PALF

Dr. D. Nag; Dr. L.K. Nayak & Dr. S.Banik

Based on the design of existing NIRJAFT PALF extractor, a modified extractor with double the dimensions of feed roller, scrapping roller & serrated roller (600 mm each) was fabricated. During trial run on developed extractor, it was found that the scrapping & serration of green leaf was not passable (Fig. 2a & Fig. 2b). The following observations were made during the trial run

- The waxy layer of leaves processed are not properly scrapped
- Serration on leaves are not adequate
- Need of conveying mechanism for scrapped/serrated leaves
- Retting by microbial culture is not enough to get fibre after washing

Fig. 2a - Pineapple Leaf

Fig. 2b - Scrapped Pineapple Leaf

Fig. 3 - Further modifications of the extractor is under progress.

QEI 15 Performance Analysis of Crop Specific Agro-textiles

Dr. B.Saha, Dr. S.Debnath, Dr. S.B. Roy and Dr. Debabrata Das

The project was taken up in the three different agro-climatic zones of West Bengal in Nadia, Birbhum and South 24 Parganas districts of West Bengal. Agro-textile materials of three different thicknesses (300, 400 and 500 gsm) were laid in the experimental plots of winter vegetables of Rama Krishna Mission Vivekananda University, Narendrapur, South 24-parganas; Bidhan Chandra Krishi Viswavidyalaya adpated farmers' field at Nadia; and research farm of Viswa Bharati university at Sriniketan, Birbhum. physical, chemical, and biological parameters of soil along with growth parameters are being assessed in the vegetable production systems of three locations.

Plate1 Fig. - Field Operations and Mulched Crops at Gayeshpur

Table1 - Physical Parameters of Agro-textiles

Parameters	Agro-textile Samples		
Nominal gsm as received from Mill	300 gsm	400 gsm	500 gsm
Actual gsm	293.54	309.52	538.17
Fabric density (g/cc)	0.108	0.110	0.135
Sectional air permeability (cc/cm/s)	11.64	11.14	8.50

The 500 g/m^2 fabric sample relatively has less amount of voids in the structure. Soil moisture status under different treatments in chilli, broccoli and french bean production systems have been studied. Results revealed that in all the production systems 500gsm agro-textiles conserved more moisture than other agro-textile materials (Table 2, 3 and 4).

Table 2 - Soil Moisture status in Chilli Production System at Gayeshpur, Nadia

Treatments	Initial Moisture %	3 DAI %	7 DAI %	14 DAI %
T1 = 300 gsm	28.2	46.7	39.9	36.6
T2 = 400 gsm	29.5	47.5	41.6	37.8
T3 = 500 gsm	30.7	48.7	43.2	38.4
T4 = Control	19.1	29.4	21.7	19.3

Table 3 - Soil Moisture Status in Broccoli Production System at RKMVU, Narendrapur

Treatments	Just Before Irrigation %	3 DAI %	7 DAI %	14 DAI %
T1 = 300 gsm	6.1	26.2	21.1	19.1
T2 = 400 gsm	6.4	25.5	22.6	19.3
T3 = 500 gsm	7.3	32.3	27.2	22.5
T4 = Control	3.5	21.4	17.1	13.7

Table 4 - Soil moisture (%) under different treatments after irrigation in French Bean production system at Sriniketan, Birbhum

Treatments	Before Irrigation	3 DAI	7 DAI	10 DAI
Control	3.2	10.0	7.6	5.4
300 gsm	7.0	13.9	10.1	9.5
400 gsm	8.1	16.9	10.5	9.2
500 gsm	6.9	18.1	12.3	9.7

DAI= Days After Irrigation

QEI 16 Development of Electronic Colour Meter for Jute and Mesta Fibre

Dr. G. Roy

In international level no such meter is available for measurement of colour of ligno cellulogic fibres. Hunter instrument is available to do similar type of testing, but that instrument is incredibly costly. Moreover, the methodology of using that instrument needs an expert operator. However, a luster meter has been developed by this institute where LDR (Light Dependent Resistor) is used to accept the reflected light from the sample under test incident from an incandescent source of light. The variation of the resistance due to variation of incident reflected light on LDR causes variation in current flowing to a local circuit of the LDR. But the disadvantage of this system is that the current is non linear with respect to amount of reflected light falling upon LDR. The new developed technology will provide a solution to this technology gap.

It was decided to develop two kinds of such meter. Those are:

1. A very handy type low cost device for the farmers
2. A Laboratory type model.

At present, the design of two such instruments is completed. Procurement and fabrication job for the low cost device is in progress.

Handy type

Mechanical Processing Division

Achievements

- Jute fancy leno fabric below 100 gsm developed in NIRJAFT handloom for dress material
- Ornamental fabric developed from 276 tex banana/polyester (75/25) yarn
- Electrical insulation tester developed for technical textiles

MP 2 Study of the weaving performance of newly developed handloom and enhancement of its figuring capacity

Dr. A.N. Roy, Dr. G. Bose and Sh. K. Mitra

Successful trials have been undertaken to weave leno fabric of three different mesh size from 100% jute yarn in both warp and weft in NIRJAFT developed handloom. Weaving trial of 100% jute fibre based fancy leno fabric was successfully made. Fine quality (less than 4lb) jute based yarn was successfully developed and introduced in fabric to produce fine quality (less than 100 GSM) fabric to be used for dress material.

Fig. - Silk sarees decorated with jute yarn using extra weft

Fabric was also developed with special design for the production of Long coat (Mackintosh type) - Cost of Manufacture approx. Rs. 2400/-.

One week training programme was organised for weavers of Ramakrishna Mission, Sargachi, Berhampore, W. B. Process has been initiated to supply one handloom to Ramakrishna Mission, Sargachi, Berhampore, W. B., who has placed order to procure one handloom developed by NIRJAFT at a total cost of Rs. 75000/-. MOU was signed with four different organisations on production of jute based decorative fabric in handloom with full technology support from NIRJAFT. An amount of Rs.1,45,000/- was received through license agreement with three different organisations for technology support on production of jute based decorative fabric in handloom.

MP 3 Processing of natural fibres like banana, and linseed in jute spinning system and development of value added products

Dr. A.N. Roy, Dr. G. Bose and Dr. N.C. Pan

Trial was successfully undertaken to spin 6lb and 8lb bleached banana fibre/polyester 75/25 blended yarn in jute spinning system. The yarns were tested for tensile properties e.g., tenacity, extension at break, initial modulus, work of rupture and abrasion resistance as mentioned in Table 1. Yarns showed reasonable tensile strength to weave fabric.

Table 1 - Physical and mechanical properties of banana/polyester fibre blended yarn

Type of yarn	Yarn linear density, tex	Twist, tpi	Tenacity, cN/tex	Breaking extension, %	Initial modulus, cN/tex	Specific work of rupture, mJ/tex-m	Abrasion resistance, No. of cycles
Banana/PET, 75/25	208	5.0	8.9	3.2	262.5	1.12	2236
	276	4.0	8.6	3.4	256.8	1.03	2894

Sample fabrics have been woven using 2/20s cotton yarn in warp and 208 tex banana/polyester 75/25 blended fibre yarn in weft with plain weave, 2/2 twill and 2/2 matt weave.

The fabrics were tested for their different physical and tensile properties which have been recorded in Table 2. 2/2 twill weave fabric showed the best results.

Table 2 - Physical and mechanical properties of banana/polyester fibre fabrics

Type of fabric	Fabric weight, GSM	Threads/inch		Crimp, %		Tenacity, cN/tex		Breaking extension, %	
		Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft
Plain weave	340	28	16	7.4	5.2	5.43	4.23	7.99	6.02
2/ twill weave	361	28	19	5.9	5.4	5.79	5.00	7.52	6.54
2/2 Matt weave	389	28	17	5.5	5.6	5.27	4.03	7.49	6.31

MP 7 Study on Bending, Frictional and Electrical behaviour of jute material

Dr. Surajit Sengupta, Dr. Sanjoy Debnath & Sh. Sujai Das

The electrical behaviour of a textile material denotes the resistance/conductance encountered during passing of steady electrical current through that textile material. In the ancient age, the conductive wire was wrapped with cotton or silk yarns for insulation. The use of textile material has been reduced with the extensive use of synthetic polymers which reduces the cost of insulation. There is enough scope for using textile material as insulator where heat is generated in the conductor during passing of current. Specially designed textile material can also be used as gloves, jackets, aprons for electrical work or as floor covering in the room where high voltage electrical appliances are kept.

For testing electrical behaviour of jute technical textiles following gaps are identified:

- There is no suitable electrical insulation tester available for jute or allied fibres
- Documented information in this field is insufficient specially with reference to jute

Following works have been done-

- Development of prototype instrument has been completed.
- Testing of jute samples have been done with this instrument.
- Tester has been standardised.
- Testing method has been developed.
- Same fabric has been tested 20 times and found that the deviation is insignificant. Therefore, the results are repetitive.

Table 1 - Electrical resistance of jute fabric

Gauge length cm	Potential difference Volt	Specific resistance, M ohm/cm		
		Canvas	Hessian	Nonwoven
2.54	80	385	499	309
	109	364	470	270
	148	361	451	243
	203	339	438	221
	228	328	400	216
5.08	80	558	752	361
	109	493	706	351
	148	493	639	334
	203	465	618	310
	228	420	571	307
10.16	80	765	1381	515
	109	728	1208	492
	148	722	1095	460
	203	677	1051	446
	228	630	984	437

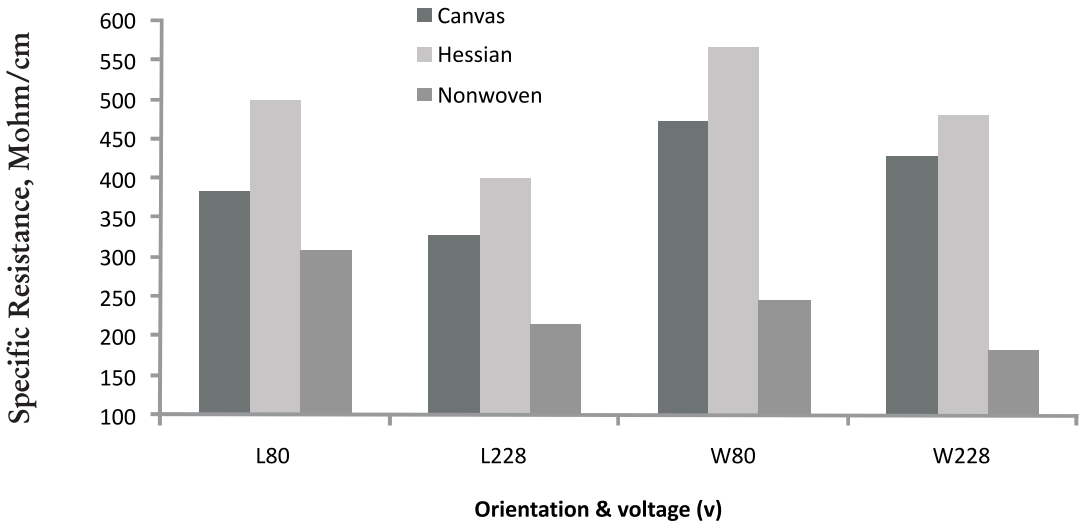


Fig 1 - Effect of fabric construction, direction of test and voltage applied on sp. resistance.

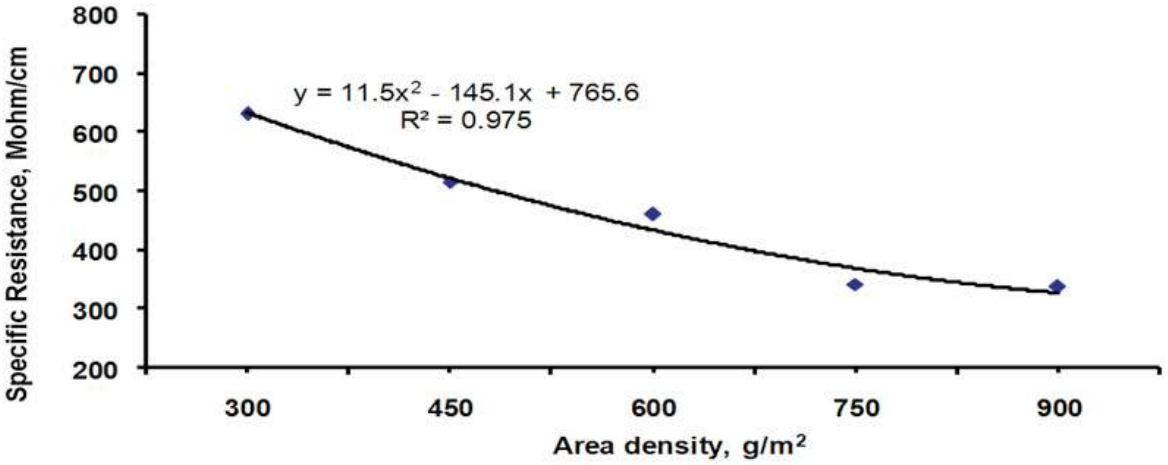


Fig. 2 - Effect of area density on sp. resistance

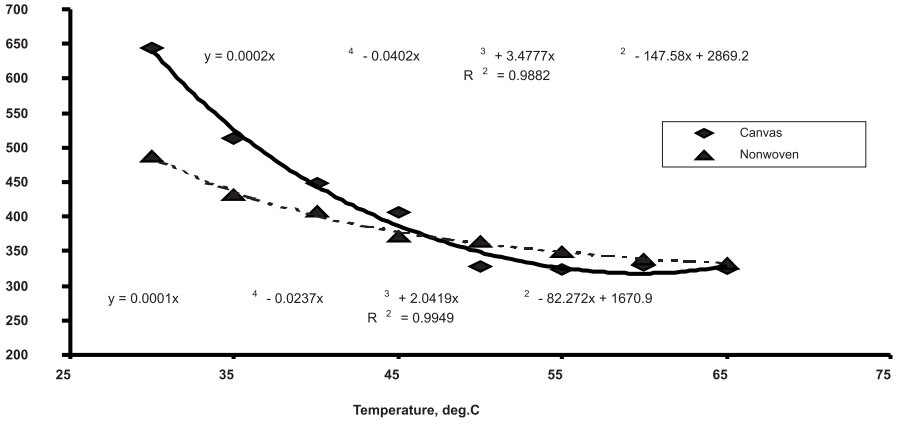


Fig. 3 - Effect of temperature on sp. resistance

From the above it can be inferred that

- Electrical resistance of jute fabric decreases with the increase in input voltage, ambient temperature, area density of fabric. It also increases with gauge length of fabric. The decrease of electrical resistance due to increase of input voltage is higher in longer gauge length.
- Electrical resistance is highest in hessian and lowest in nonwoven keeping canvas in between.
- Lengthwise electrical resistance is higher than width wise resistance of needle punched jute nonwoven fabric. In case of woven fabrics, the effect is reversed.
- All the above phenomena will help to design technical textiles out of jute where it can be used as electrical insulator.

Fig 4(a) - Front view of instrument

Fig 4(b) - Tools and box

MP 8 Process technology for value added diversified products from blends of pineapple / silk / ramie.

Sh. Seiko Jose, Dr. Gautam Basu, Sh. Izhar Mustafa

India is one of the major producers of pine apple and the cultivation is spread in various states in an area of more than 80,000 ha with potential yield of fibre of about 7 lakh tones. The climatic conditions prevailing in the humid coastal regions of peninsular India and hilly areas of North-Eastern region are most suitable for its cultivation. Pineapple leaf fibre is generally extracted by water retting, which yields about 2.5-3.5 % fiber. The properties of textile grade PALF fiber, lies between jute and ramie.

PALF extraction process is the key factor in the determination of the fibre quality and quantity. Extraction can be done manually or mechanically. After the extraction of the fibres from the leaves, the fibres seem to be stuck together by means of gummy substance. This gum will act as inhibitor for further wet processing of the fibre. The process of removal of gum from the fiber is known as degumming. Degumming can be performed either with chemicals, enzymes, or with micro-organisms. In chemical degumming of PALF, NaOH (Caustic Soda) is used to remove the gum content from PALF fiber.

Decorticated fibers are subjected to combined degumming and bleaching process, which resulted in increase in the tensile modulus and strength of the PALF over those of the untreated fibers.

Table 1 - Physical parameters of PALF after combined degumming and bleaching.

Sl. No	Parameters	Before degumming	After combined degumming and bleaching
1	Whiteness Index (HUNTER)	44.33	59.53
2	Brightness Index (TAPPI 452)	15.38	41.18
3	Absorbency (sec)	40	2
4	Bundle Strength (g/Tex)	13.6	17.0
5	Moisture regain (%)	5.8	8.0
6	Degumming weight loss (%)	--	4.8

The absorbancy, whiteness index, brightness index are considerably improved. A weight loss of around 4.8% is observed after the process. Degumming process will remove certain amount of lignin, wax and oils, which are covering the external surface of the fibre. Due to removal of theses undesired materials, the textile properties of the fibres are found to improve considerably. The FTIR analysis of decorticated PALF and degummed PALF has been done as illustrated in the Fig-1.The reduction in the peak corresponds to1250cm^{-1} indicates the removal of lignin from the decorticated fibre.

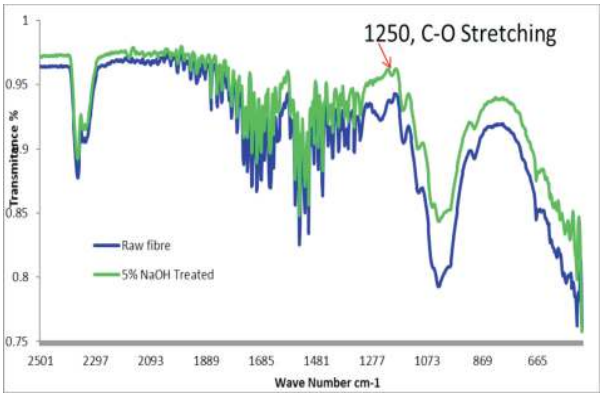


Fig. 1 - FTIR Analysis-Raw and degummed PALF fibre

Fig. 2 - Raw PALF fibre

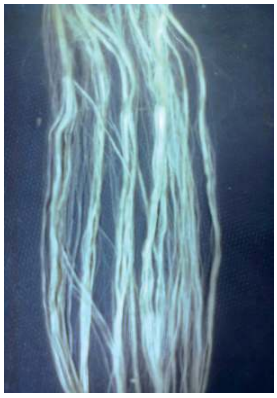


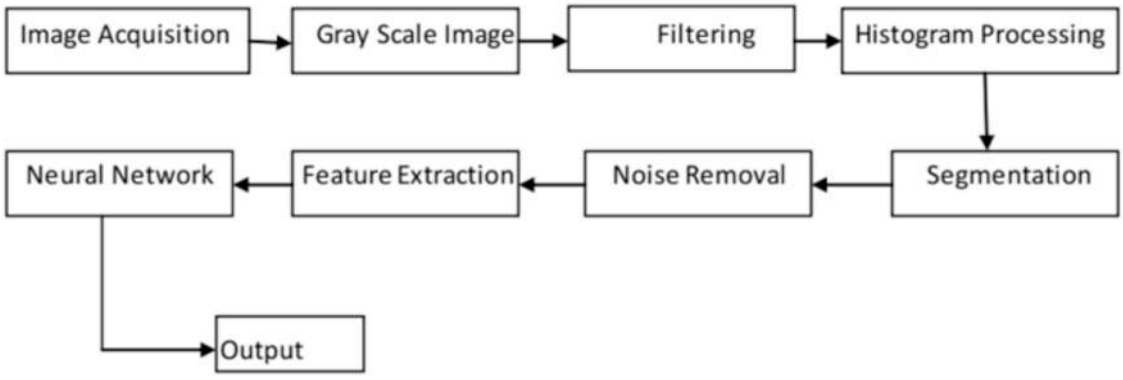
Fig. 3 - Degummed PALF fibre

MP 9 : Development of suitable expert system for analysis of defects in jute fabrics.

Sh. Sujai Das

Fabric inspection system is important to maintain the quality of fabric. Fabric inspection is carried out manually with human visual inspection for a long time. The work of inspectors is very tedious and consumes time and cost. To reduce the wastage of cost and time, automatic fabric inspection is required. This paper proposes an approach to recognize fabric defects in textile industry for minimizing production cost and time. The Fabric inspection system first acquires high images of the fabric. Then the acquired images are subjected to defect segmentation algorithm. The output of the processed image is used as an input to the Artificial Neural Network (ANN) which uses back propagation algorithm to calculate the weighted factors and generates the desired classification of defects as an output. Work has been done using detecting fabric image for image acquisition, gray scale conversion, filtering, etc.

Overview of the Proposed System



Chemical and Bio Chemical Processing Division

Achievements

- Improvement of physical properties of paper by adoption of mild pulping process using brighter and finer jute fibres obtained after bio-treatment followed by peroxide treatment

- Production of particle board using bioadhesive, chitosan, or soya protein and babool mixture (50/50) - an alternative environment friendly technology.

- Antimicrobial finishing of jute textiles by nanosilver obtained by synthesis of stable nanosilver colloidal solution and optimization by an orthogonal matrix array method.

CBP 7 Application of enzymes for making pulp and paper with improved characteristics using different lignocellulosic fibre.

Dr. S.N. Chattopadhyay and Dr. A.K. Roy

Jute fibres were treated with different enzymes and combination of enzymes in different sequences to study the effect of pre-treatment on optical and physical properties of fibres and to correlate them with paper characteristics. Two commercial enzymes viz. Texbio M (cellulose and xylanase based enzyme supplied by M/s Tex Biosciences (P) Pvt. Ltd., Chennai) and Laccase 208 (lignin degrading enzyme procured from Enzyme India Pvt. Ltd., Chennai) were used for this purpose. The control and enzyme treated fibres were subjected to hot peroxide treatment. Simple enzyme treated samples and enzyme treated followed by hot peroxide treated samples were beaten in a laboratory scale valley type beater to produce pulp of 40°SR freeness and 60 GSM papers were produced using semi automatic paper sheet making machine. The different steps are as follows.

Enzyme Treatment:

A) Laccase treatment: Jute fibre was treated with a solution containing laccase 208 (0.5%, owf), Hydroxy Benzo Triozole (HBT, 0.5%, owf) using a material to liquor ratio of 1:10 at a temperature of 50°C. The material was treated for 4 hours with constant stirring (40 rpm) at a pH of 4.0-5.5 (using acetic acid - sodium acetate buffer). Then the content was boiled for 1 hour with 0.5% Ultravon JU (non-ionic detergent), washed and dried.

B) Cellulase-Xylanase treatment : Jute fibre was treated with a solution containing Texbio M (2%, owf) using a material to liquor ratio of 1:10 at a temperature of 50°C. The material was treated for 4 hours with constant stirring (40 rpm) at a pH of 4.0-5.5 (using acetic acid - sodium acetate buffer). Then the content was boiled for 1 hour with 0.5% Ultravon JU (non-ionic detergent), washed and dried.

C) Combined treatment of Cellulase-Xylanase and Laccase: Jute fibre was treated with a solution containing Laccase 208 (0.5%, owf), Hydroxy Benzo Triozole (HBT, 0.5%, owf), Texbio M (2%, owf) using a material to liquor ratio of 1:10 at a temperature of 50°C. The material was treated for 4 hours with constant stirring (40 rpm) at a pH of 4.0-5.5 (using acetic acid - sodium acetate buffer). Then the content was boiled for 1 hour with 0.5% Ultravon JU (non-ionic detergent), washed and dried.

D) Sequential treatment of Cellulase - Xylanase followed by Laccase: Jute fibre was treated with a solution containing Texbio M (2%, owf) using a material to liquor ratio of 1:10 at a temperature of 50°C. The material was treated for 4 hours with constant stirring (40 rpm) at a pH of 4.0-5.5 (using acetic acid - sodium acetate buffer). Then the content was boiled for 1 hour with 0.5% Ultravon JU (non-ionic detergent) and washed. The Texbio M treated sample was subsequently treated as in (A)

E) Sequential treatment of Laccase followed by Cellulase-Xylanase: Jute fibre was treated with a solution containing Laccase 208 (0.5%, owf), Hydroxy Benzo Triozole (HBT, 0.5%, owf) using a material to liquor ratio of 1:10 at a temperature of 50°C. The material was treated for 4 hours with

constant stirring (40 rpm) at a pH of 4.0-5.5 (using acetic acid - sodium acetate buffer). Then the content was boiled for 1 hour with 0.5% Ultravon JU (non-ionic detergent) and washed. The Laccase treated sample was subsequently treated as in (B).

Hot Peroxide Treatment (P)

Control jute fibre and a portion of all the enzyme treated jute fibres were treated in a solution containing sodium hydroxide (2%, owf), hydrogen peroxide (0.5%, owf) at a temperature of 90°C for 3 hours, using a material to liquor ratio of 1:10. The samples were washed thoroughly using hot and normal water.

Beating

Enzyme treated and enzyme followed by hot peroxide treated fibres were subjected to beating in laboratory scale valley type beater for different durations to produce pulp of 40°SR freeness.

Paper sheet formation

Paper sheets of 60 GSM were produced using semi automatic paper sheet machine.

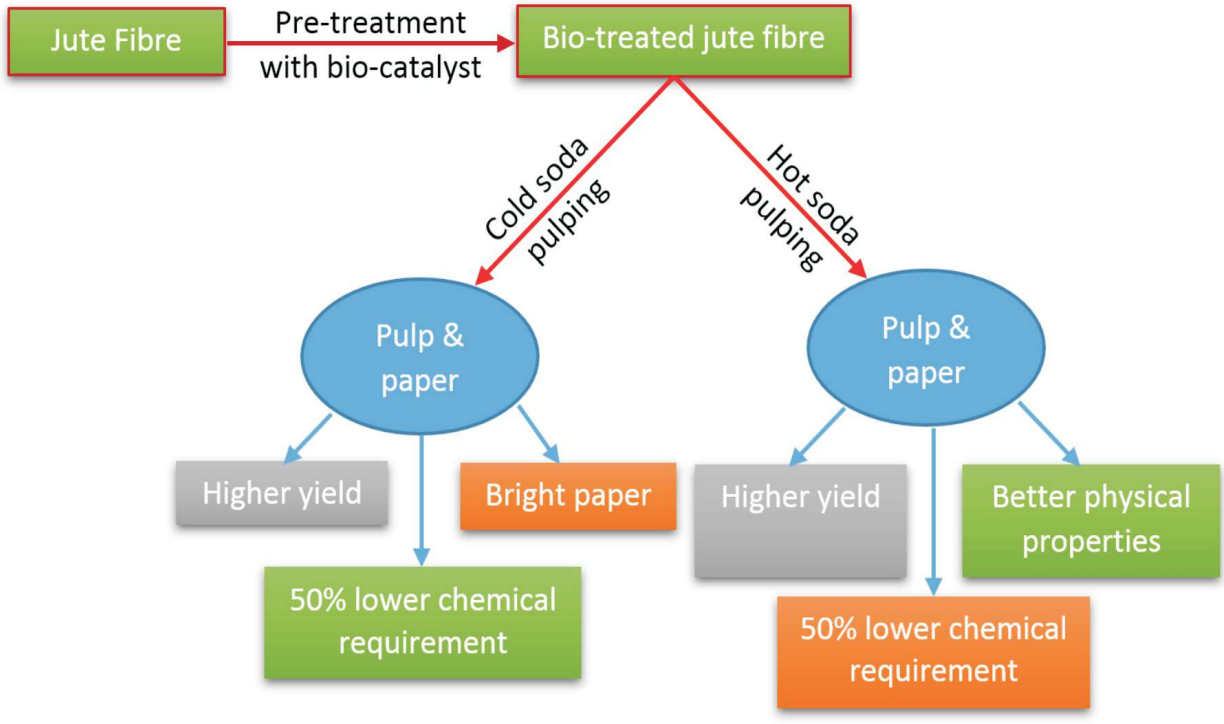


Fig. 1 - Schematic diagram for paper sheet formation using biotechnology

Evaluation

Control, enzyme treated, enzyme followed by hot peroxide treated fibres & paper sheets produced from all these fibres were kept under standard testing conditions and following tests were carried out.

Optical properties : The whiteness index in HUNTER scale, yellowness index in the ASTM D1925 scale and brightness index in TAPPI 452 scale of Control, enzyme treated, enzyme followed by hot peroxide treated fibres , paper sheets produced from all these fibres was determined by Spectrascan-5100 computerised colour matching system using relevant software.

Physical properties: Bundle strength and air flow fineness of control, enzyme treated and enzyme followed by hot peroxide treated fibres were evaluated by standard testing procedure. Whereas paper sheets produced from all these fibres were evaluated for tensile properties by Tappi Test Method - T404 om-85, bursting index by Tappi Test Method - T403 om-85, tearing strength by Tappi Test Method - T414 om-88 and Folding endurance (Schopper type) by Tappi Test Method - T423 om-89

All the treated fibre samples along with their sample codes have been tabulated in Table-1 and results of evaluation of the samples have been tabulated in Table-2 and Table-3.

Table 1 - Samples produced by different treatments

Sl No	Sample	Sample Code
1	Control	-
2	Only hot peroxide treated	P
3	Laccase treated and Laccase treated followed by hot peroxide treated	A & AP
4	Cellulase-Xylanase treated and Cellulase - Xylanase treated followed by hot peroxide treated	& BP
5	Combined cellulase-Xylanase & laccase treated and Combined cellulase-Xylanase & laccase treated followed by hot peroxide treated	C & CP
6	Sequential treatment of Cellulase -Xylanase followed by Laccase and Sequential treatment of Cellulase - Xylanase & Laccase followed by hot peroxide	D & DP
7	Sequential treatment of Laccase followed by Cellulase - Xylanase and sequential treatment of Laccase & Cellulase - Xylanase followed by hot peroxide	E & EP

Table 2 - Optical and physical properties of fibre samples

Sample	Whiteness Index	Yellowness Index	Brightness Index	Tenacity gm/	Airflow fineness Tex
Control	-	-	-	27.16	2.4
P	68.41	29.30	41.53	23.59	2.4
A	62.85	28.83	35.31	24.37	2.3
AP	74.89	28.74	49.77	24.05	2.2
B	60.75	32.46	32.31	24.31	2.2
BP	70.87	29.10	44.57	23.82	2.2
C	56.12	33.12	27.65	23.98	2.2
CP	69.27	29.66	42.48	22.18	2.1
D	65.93	28.17	38.86	19.20	2.2
DP	66.72	29.76	39.43	18.82	2.1
E	67.87	29.25	40.93	14.70	2.0
EP	71.08	28.23	45.07	16.24	2.1

Table 3 - Optical and physical properties of paper samples

Sample	Brightness Index	Fold endurance	Tensile Index Nm/ g	Burst Index $KPam^2/ g$	Tear Index mNm^2/ g
Control	-	-	-	-	-
P	42.36	5	25.31	1.23	6.13
A	36.19	5	25.24	1.25	6.67
AP	50.62	7	22.89	1.09	6.65
B	33.36	12	24.09	1.08	7.45
BP	46.26	10	20.29	0.82	4.67
C	28.65	8	24.38	1.16	6.44
CP	44.13	4	18.68	0.81	5.71
D	40.06	3	21.09	0.79	7.36
DP	42.61	3	16.61	0.59	5.09
E	42.49	4	12.19	-	5.48
EP	47.71	2	14.17	-	5.40

Chief findings:

- Biotreatment followed by peroxide makes the paper bright
- Sequential treatment of lacasse and cellulose-xylanase makes the fibres bright with some reduction in fibre tenacity
- Fibres becomes finer after enzyme treatment
- Folding properties of papers made from bio-treated and peroxide-treated fibres are poor.
- There may be a need for adoption of mild pulping process after bio-treatment for improvement of physical properties of paper.

CBP 8 Development of bio-adhesives for the use of agricultural residues (cassava stalk, coconut stem) in preparation of particle boards

Dr. N.C. Pan

Bio-adhesives are biodegradable and environment friendly in nature. Apart from jute stick other raw materials viz. cassava stalks, coconut stems will be used for producing particle board. As cassava cultivation increases, more stalks will become available for disposal. Particle boards are made from cassava stalks. In this study, biodegradable adhesives viz. chitosan, soya protein and babool are used either alone or in combination. These boards are compared with boards prepared with synthetic resin like urea formaldehyde resin.

The processes of making particle boards are as under:

Cassava stalks were cut into small pieces and chipped in grinding machine. Chipped particles after uniform mixing with synthetic resin, urea formaldehyde (UF), in different concentration (7%, 9%,12%) in an U-trough mixer fitted with sigma type blade were transferred in a square mould which has supported with smooth aluminium plates on both sides and transferred in hydraulic press. The optimum temperature 140^{o}C, pressure 200 Kgf/cm^{2} and time 25 minutes were maintained. Thereafter the pressure was released and the board was taken out in hot condition and allowed to cool. After it has been cooled, the board edge - finished by electric sawing machine and stored for conditioning.

Particle Board from Cassava Stalk

Chipped Cassava stalks particles after uniform mixing with bioadhesive, Chitosan, in different concentration (1%, 3%,5%,7%,9%) in an U-trough mixer fitted with sigma type blade were transferred in a square mould which has supported with smooth aluminium plates on both sides and transferred in hydraulic press.

The optimum temperature 160°C, pressure 200 Kgf/cm^2 and time 25 minutes were maintained. Thereafter, the pressure was released and the board was taken out in hot condition and allowed to cool. After it has been cooled, the board edge - finished by electric sawing machine and stored for conditioning.

The developed board was evaluated for different physical properties viz, flexural strength, flexural modulus, moisture uptake (24h), etc following standard procedure. The results are tabulated in table 1 and table 2 respectively.

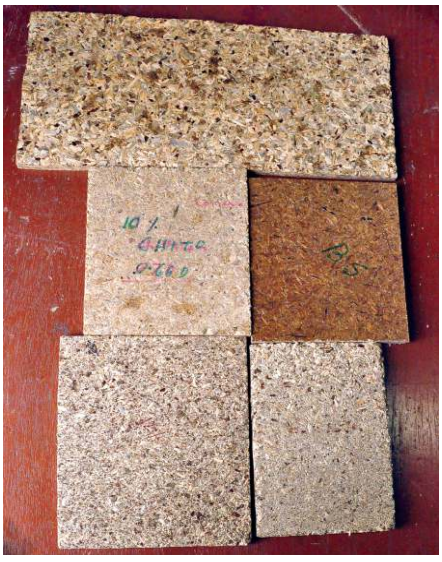
Table 1 - Mechanical properties of cassava stalk boards using urea formaldehyde resin

Sl No	Cassava stalk particle board using	Flexural strength MPa	Flexural modulus GPa	Moisture uptake (24h) %
1	7% UF Resin	2.61	0.44	5.7
2	9% UF Resin	3.18	0.51	5.3
3	12% UF Resin	5.31	0.91	5.1

Table 2 - Mechanical properties of cassava stalk boards using bioadhesive, Chitosan

Sl No	Cassava stalk particle board using	Flexural strength, MPa	Flexural modulus GPa	Moisture uptake (24h), %
1	1% Chitosan	2.33	0.55	8.87
2	3% Chitosan	2.99	0.65	8.91
3	5% Chitosan	4.75	0.84	8.67
4	7% Chitosan	6.55	1.53	8.81
5	9% Chitosan	6.21	1.51	8.86

Chipped Cassava stalks particles after uniform mixing with bioadhesive, soya protein, in different concentration (9%, 12%, 15%) in an U-trough mixer fitted with sigma type blade were transferred in a square mould which has supported with smooth aluminium plates on both sides and transferred in hydraulic press. The optimum temperature 140°C, pressure 200 Kg/cm^2 and time 25 minutes were maintained. Thereafter the pressure was released and the board was taken out in hot condition and allowed to cool. After it has been cooled, the board edge - finished by electric sawing machine and stored for conditioning.



Chipped particles Cassava stalks after uniform mixing with a mixture of bioadhesives, babool and soya protein, in different

proportion (25/75, 50/50, 75/25) in an U-trough mixer fitted with sigma type blade were transferred in a square mould which has supported with smooth aluminium plates on both sides and transferred in hydraulic press. The optimum temperature 140°C, pressure 200 Kg/cm^2 and time 25 minutes were maintained. Thereafter the pressure was released and the board was taken out in hot condition and allowed to cool. After it has been cooled, the board edge - finished by electric sawing machine and stored for conditioning.

The developed board was evaluated for different physical properties viz, flexural strength, flexural modulus, ILSS, moisture uptake (24h), etc following standard procedure. The results are tabulated in table 3, and table 4 respectively.

Table 3 - Mechanical properties of cassava stalk boards using soya protein adhesive

Sl No	Cassava stalk particle board using	Flexural strength MPa	Flexural modulus GPa	ILSS N/mm^2	Moisture uptake (24h) %
1	9% Soya Protein	1.84	0.27	0.06	7.54
2	12% Soya Protein	4.43	0.69	0.14	8.63
3	15% Soya Protein	4.06	0.67	0.15	8.86

Table 4 - Mechanical properties of cassava stalk boards using soya protein and babool adhesive mixture

Sl No	Cassava stalk particle board using	Flexural strength MPa	Flexural modulus GPa	ILSS N/mm^2	Moisture uptake(24h) %
1	Babool/Soya Protein (25/75)	3.65	0.66	0.11	8.45
2	Babool/Soya Protein (50/50)	5.78	0.74	0.18	8.81
3	Babool/Soya Protein (75/25)	5.74	0.70	0.16	9.15

Chief findings:

- Production of particle board using bioadhesive, chitosan, is an alternative environment friendly method.
- The process and the product made by using chitosan are comparable with that produced by conventional UF resin.
- This will give an opportunity for alternative use of raw materials.

- Making of particle board using bioadhesives, soya protein and babool mixture (50/50) showed encouraging results and comparable with boards prepared from synthetic resin in respect of strength.
- The process and the product made by using bioadhesives will be environment friendly and biodegradable.

CBP 09 Functional finishing of jute textile by suitable nano-particles

Dr. L. Ammayappan and Dr. D.P. Ray

Antimicrobial finishing of jute textiles by nano silver

Synthesis of stable nanosilver colloidal solution was optimized by an orthogonal matrix array method, in which concentration of sodium borohydride (1,5 & 10 mM), concentration of sodium citrate (0.25, 0.50 & 1 mM) and time (30, 60 & 120 minutes) were variables and concentration of silver nitrate was kept 1mM and it is compared with 10mM $AgNO^3$ as control.

Table 1 - Experimental plan for synthesis of nanosilver

S. No.	$NaBH_4$ mM	Trisodium citrate mM	Time min.
Std	10	1	120
1	1	0.25	30
2	1	0.50	60
3	1	1.00	120
4	5	0.25	60
5	5	0.50	30
6	5	1.00	120
7	10	0.25	120
8	10	0.50	30
9	10	1.00	60

TGA

TGA curve of the untreated jute fibre shown a distinct peak for amorphous region at around 270°C, while in nanosilver applied jute fibre the peak appeared near 285°C, which confirmed some portion of the nanosilver bonded at amorphous region of the jute fibre. The presence of nanosilver is also confirmed by increase in the degradation temperature of the fibre. It is also inferred that thermal stability of nanosilver applied jute fibre is slightly increased in comparison with untreated jute fibre.

FTIR

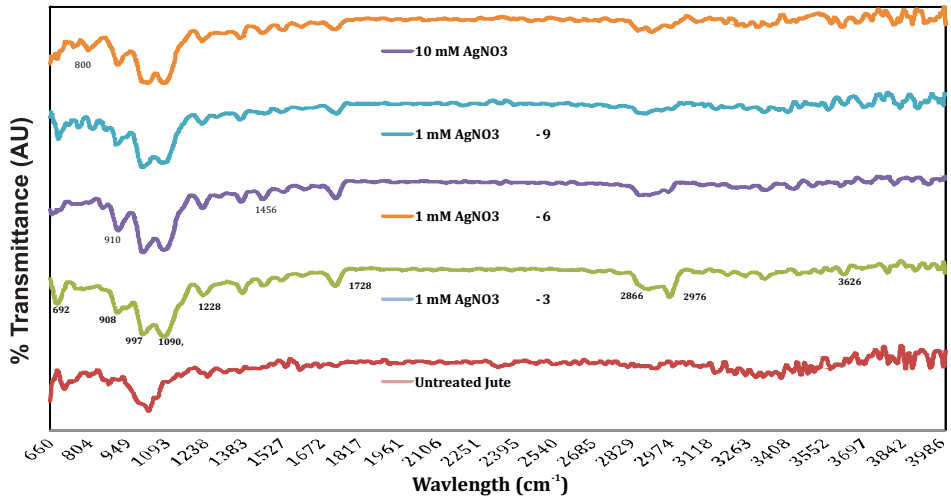
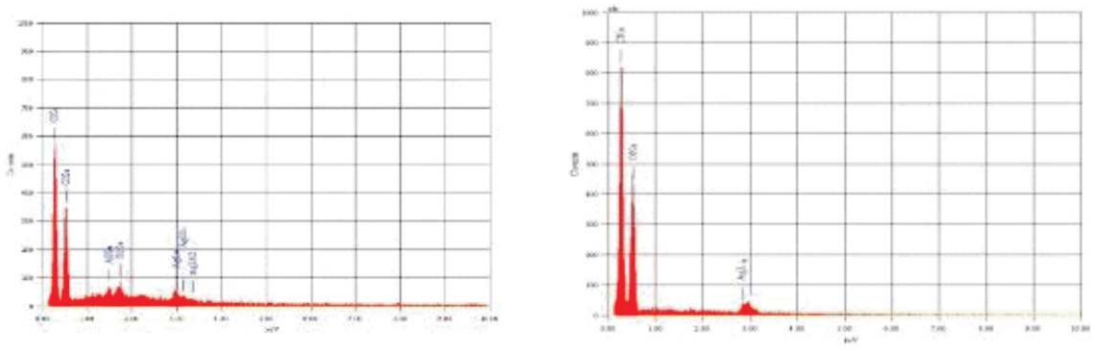


Fig. 1 - FTIR spectra.

FTIR Spectra inferred that nano silver applied jute fibre shown some distinct difference against untreated jute fibre. The additional peak at 1375 cm?1 in the spectrum may be due to the complexation between and Ag+ and -OH group of the cellulose polymer. In addition , formation of new peaks at 1090, 997, 908, 800 and 695 cm-1 that assigned to -OH association bond, -C-O-C stretching in cellulose, -glucosidal linkage, vibration of -OH bond in hemicellulose and -C-OH bond out of plane respectively. The formation of bonding between nanosilver and amorphous region of the jute fibre may lead to increase in the new bonds in the jute fibre. Further no appreciable change has been observed for other peaks marked.

SEM with EDX



Standard **Sample No.3**

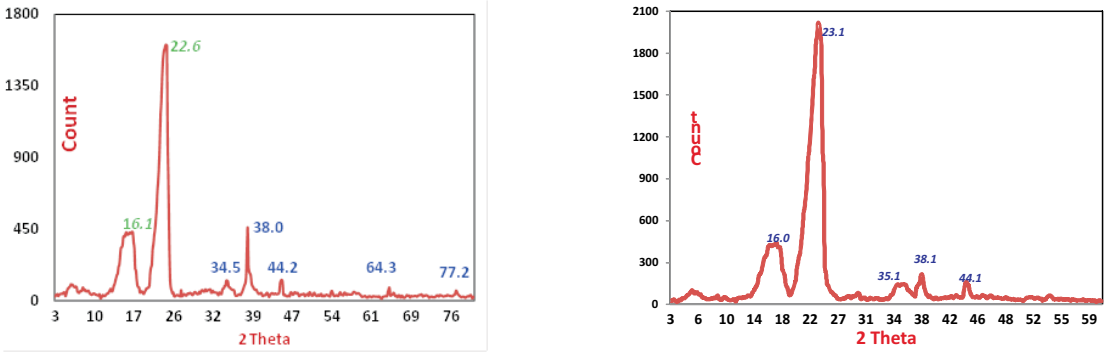
Fig. 2 - EDX spectra of nanosilver applied jute fibre

EDX method is used to confirm the presence of silver element on the surface of a fibre, and from the EDX data, the presence of silver element in all samples was confirmed and SEM images further confirmed the adsorption of silver in nano stage on the surface of jute fibre. SEM images also inferred

that dispersion of nanosilver on the surface of the jute fibre is more in the standard sample than other experimental samples. Since in experimental samples the concentration of precursor is low and so the number of nano silver and their availability to bonding with jute fibre is less.

pXRD value

From the XRD spectra it is observed that all nanosilver applied jute fibers exhibit typical sharp high peaks at around 2 = 23.3?, and one weaker diffraction peak at around 2 = 16.1?, which are assigned to crystalline and amorphous regions of cellulose I respectively. It is observed that, all samples have diffraction peaks on 2 scale at 38.1 and 44.2 other than 16.1 and 23.3 are observed. These peaks are representing the face centered cubic (FCC) phase structure of silver nanoparticles in Bragg's reflections at (1, 1, 1) and (2, 0, 0) planes respectively. These peaks confirmed the deposition of nano silver on the surface of the fiber, which bonded through hydrogen bonding with functional groups of jute fibre.



Standard **Sample No.3**

Fig. 3 - pXRD spectra of nanosilver applied jute fibre

Quantification of nano silver by ICP-AES

The amount of nanosilver present on the jute fibre was evaluated by ICP-AES (ppm) analysis and SEM with EDX (%) method. ICP-AES values of nano silver applied jute fibre are ranged from 0.23 to 1.29 ppm and the value is higher in standard sample due to high concentration of $AgNO_3$. The quantity of nano silver present in the jute fibre varied, which may be due to variation in the size and shape of nanosilver in the colloidal solution, which significantly influenced the bonding between nano silver and functional groups of jute fibre. Due to variation in the bonding, the concentration of nano silver on the jute fibre was varied.

Antimicrobial activity

Qualitative evaluation i.e. zone of inhibition of antibacterial and antifungal activity as per AATCC Method of sample no. 8 shown good zone of inhibition (*Aspergillus Niger*-2.8mm; *Bacillus Subtilis*-2.2mm & Escherichia Coli- 2.7mm) and for other samples is in progress.

Table 2 - Zone of inhibition (mm)of nano silver applied jute fabric (Mean SEM)

Microorganism→ Sample ↓ Untreated	*Bacillus Subtilis* No	*E Coli* No	*Aspergillum Niger* No
1	2.1±0.1	2.3±0.1	2.0±0.1
2	2.3±0.2	2.5±0.2	2.4±0.2
3	2.1±0.1	2.4±0.1	2.3±0.1
4	2.1±0.1	2.3±0.1	2.6±0.1
5	2.2±0.1	2.4±0.1	2.3±0.1
6	2.2±0.2	2.6±0.2	2.6±0.2
7	2.4±0.2	2.7±0.2	2.3±0.2
8	2.5±0.3	2.8±0.3	2.8±0.3
9	2.1±0.2	2.3±0.2	2.2±0.2
Std	4.1±0.2	5.2±0.2	4.1±0.2

The mean particle size of the nano silver in the colloidal solution was calculated using particle size analyzer and it was found that the mean value is 54nm with 22.03x108 particles/ml. it also confirmed the formation of nano silver at the given condition . From the results, the optimized condition for synthesis of stable nanosilver colloidal solution was 1mM silver nitrate; 10 mM sodium borohydride and 0.50 mM sodium citrate and it could be applied to jute fabric by exhaustion method to impart antibacterial as well as antifungal finishing on jute textiles.

Transfer of Technology Division

Achievements

- Increasing trend observed in case of floor covering and shopping/hand bag export earnings over the last decade with brighter prospect in near future

- Two Agri-Business meets at NIRJAFT and two Agribusiness Camps at NRC on Yak, Dirang, AP and ICAR Research Complex for NEH Region, Barapani, Meghalaya organized

- Nine MOU and three MOA signed with different entrepreneurs on NIRJAFT technologies

- Three training programmes on jute handicrafts, jute based ornaments and jute handbags respectively organized for entrepreneurship development

- Participation in four different exhibitions, one farmers' fare, three workshops and two business meet where some institute technologies and products of three of our incubatees were showcased

TOT 7 Studies on techno-economic constraints and opportunity of jute diversified products manufacturing.

Dr. S.B. Doy

Today, India is one of the largest producers of jute products in the world and commands a fortune out of it. Government of India is trying to rejuvenate the jute sector through various activities and policy decisions. The traditional concept of jute as packaging material has undergone substantial changes. A huge demand for various diversified jute products viz. carry/shopping bags, shoes, composite materials, geo-textiles, home textiles, handicrafts, gift items, pulp and paper etc. is continuously increasing in both local and foreign markets.

Export of Jute from India: JDPs Vs Total Jute Goods

On examination, the relative performance of Jute Diversified Products (JDP) export in total jute products export observed during last decade increased significantly. The share of diversified jute exports in total jute exports in the year 2012-13 was over 19%.

Table 1 -Export of Jute from India: JDPs Vs Total Jute Goods

Year	**Jute Goods Export** (Rs. In crores)								
	JDPs						Total JDPs	Total Jute Goods	Share of JDPs
	Floor Covering	Shopping / Hand	Blanket	Decorative Fabrics	Gift Articles	Wall Hanging			
2000 01	66.31	54.53	0.43	4.21		5.67	131.15	931.71	14%
2001-02	76.63	39.97	0.77	2.52	--	6.38	126.27	613.32	21%
2002-03	124.18	60.98	2.82	2.81	5.44	6.93	203.16	913.32	22%
2003-04	104.37	106.57	8.20	1.30	2.24	0.59	223.27	1051.88	21%
2004 05	155.75	80.87	10.94	3.88	1.68	0.64	253.76	1146.90	22%
2005-06	213.39	88.00	6.24	2.29	2.16	0.46	312.54	1186.24	26%
2006-07	167.57	70.31	15.01	2.19	0.97	0.42	256.47	1055.16	24%
2007-08	182.59	112.28	0.68	1.68	1.11	0.22	298.56	1178.49	25%
2008-09	124.24	165.68	2.37	1.72	0.40	0.11	292.16	1216.16	24%
2009 10	126.89	98.13	1.77	2.15	1.76	0.12	229.06	859.46	27%
2010-11	134.24	126.42	0.76	2.86	2.29	3.00	268.80	1854.15	14%
2011-12	142.01	163.66	0.07	8.61	1.46	4.10	319.84	2094.96	15%
2012-13	178.99	169.69	0.24	7.25	6.17	0.21	362.55	1951.08	19%

Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Kolkata, under the Ministry of Commerce, Government of India

Contribution of JDP export to the all jute goods export from India during the period 2000-01 to 2012-13 is increased from 14 per cent to 19 per cent ranging from Rs. 131.15 crores to 362.55 crores in monetary terms. India's total jute goods export was Rs. 931.71 crores and Rs. 1951.08 crores during the same period.

Trend analysis of jute diversified products export in value term showed different directions for different products over the years. Linear trend line was fitted with last ten years export data and forecasted for five years for individual identified jute diversified products contributing significant amount in foreign exchange earnings for India. On examination, the relative performance of Jute Diversified Products (JDP) export in total jute products export observed during last decade increased significantly. A closer look at the Indian diversified jute exports showed a very worthy trend. The share of diversified jute exports in total jute exports in the year 2012-13 was 19 per cent It is important to note here that export value of jute goods was significantly higher than jute diversified products throughout the time period.

Export of jute diversified products in financial year 2012-13 was Rs. 362.55 crores, which was a notable rise by 176.44 per cent rise in value terms over the corresponding figures of financial year 2000-01 in India. India's export basket is concentrated in only about five traditional jute products including yarn and five JDPs. Production of value added jute products would create additional employment opportunities and assist in alleviating poverty. Production of jute diversified products increased through medium and small sector entrepreneurs, NGOs, SHGs, WSHGs and individual manufacturers.

Trend Analysis and Forecasting of Jute Diversified Products Export

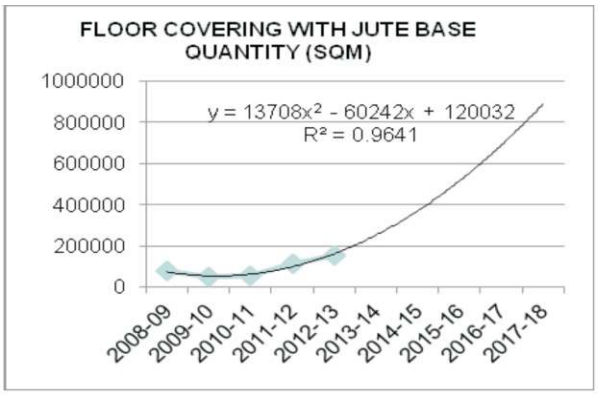
Trend line was fitted with last ten years export data in value term and last five years data on quantity term, and forecast has been made for next five years for individual identified jute diversified products.

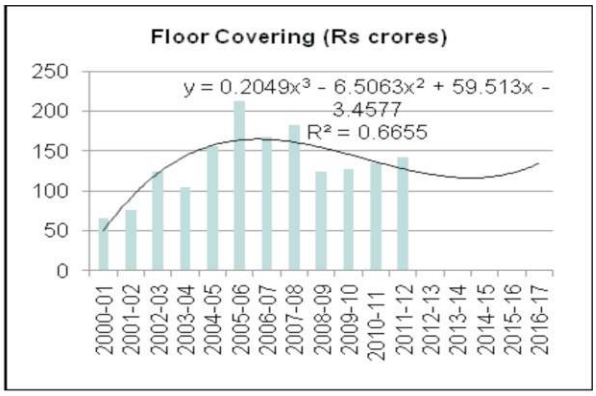
Choosing the Best Trend line for our Data

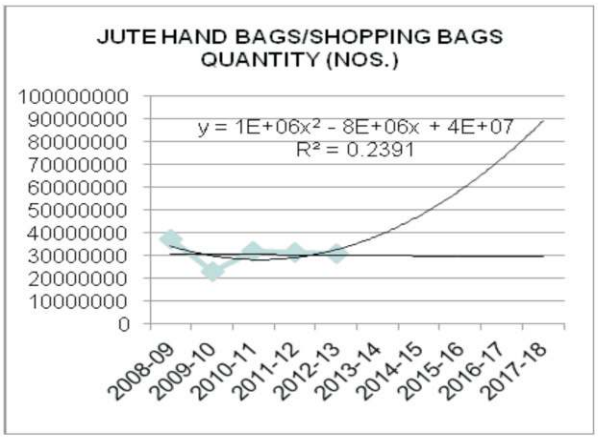
For the trend line one of the following ternd/ regression types has been chosen-

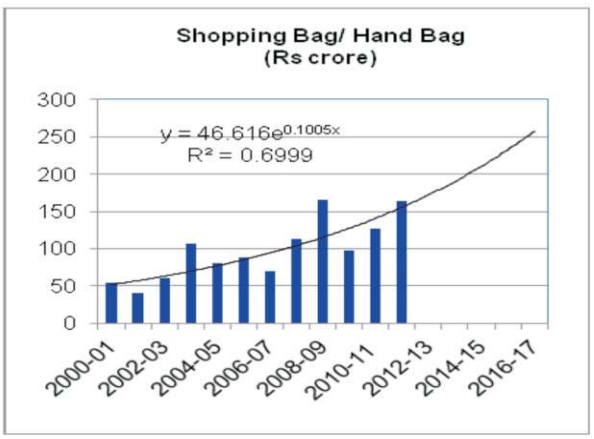
- **Linear -** increasing or decreasing at a steady rate,
- **Logarithmic -** increases or decreasing quickly,
- **Polynomial -** data fluctuating,
- **Power -** increasing at a specific rate,
- **Exponential -** rising or falling at increasingly higher rates, and
- **Moving average -** smoothing out the fluctuations.

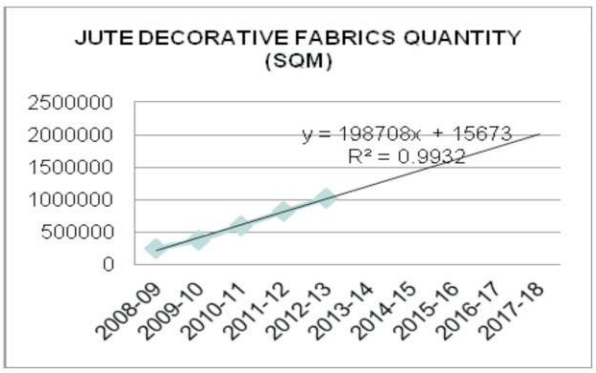
The type of available data determines the type of trend line to be assumed. We shall choose a trend line that is A reliable trend line should be chosen when its R-squared value approaches at or near 1.

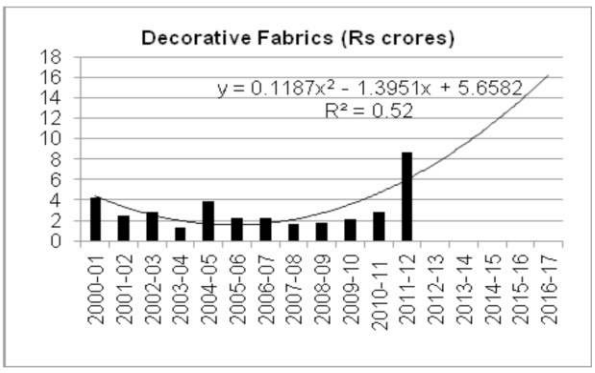

FLOOR COVERING WITH JUTE BASE QUANTITY (SQM)
y = 13708x² - 60242x + 120032
R² = 0.9641
1000000
800000
600000
400000
200000
0
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18

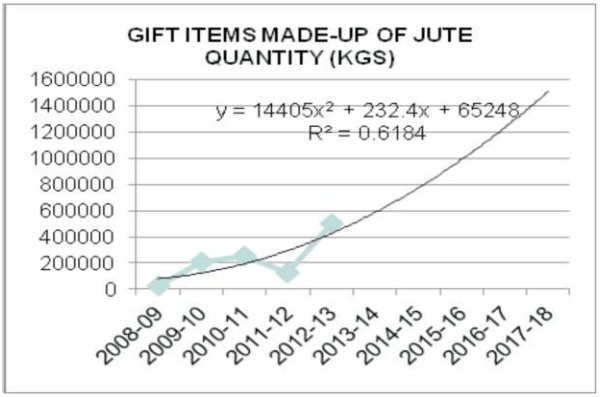

Floor Covering (Rs crores)
y = 0.2049x³ - 6.5063x² + 59.513x - 3.4577
R² = 0.6655
250
200
150
100
50
0
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17

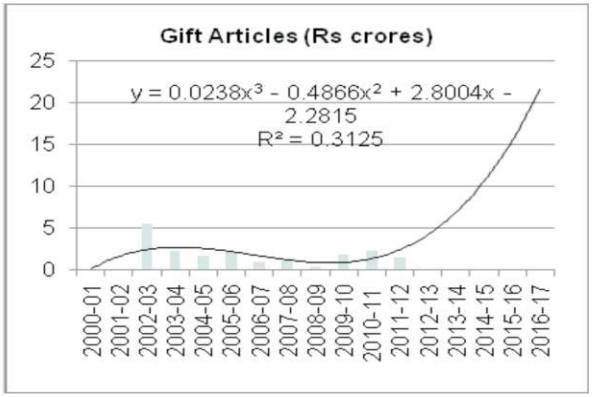

JUTE HAND BAGS/SHOPPING BAGS QUANTITY (NOS.)
y = 1E+06x² - 8E+06x + 4E+07
R² = 0.2391
100000000
90000000
80000000
70000000
60000000
50000000
40000000
30000000
20000000
10000000
0
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18

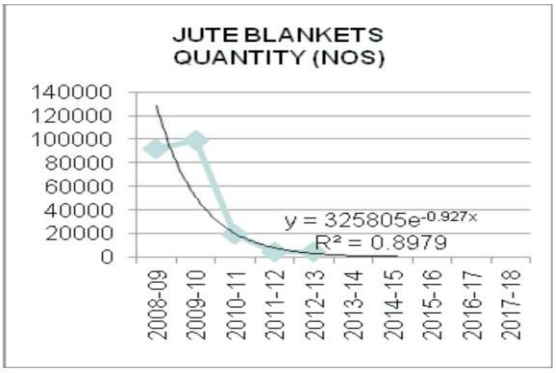

Shopping Bag/ Hand Bag (Rs crore)
y = 46.616e^0.1005x
R² = 0.6999
300
250
200
150
100
50
0
2000-01
2002-03
2004-05
2006-07
2008-09
2010-11
2012-13
2014-15
2016-17

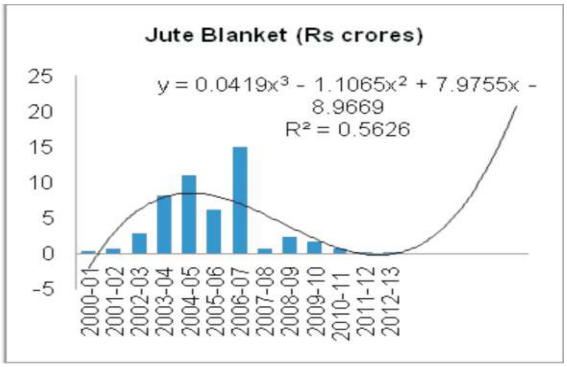

JUTE DECORATIVE FABRICS QUANTITY (SQM)
y = 198708x + 15673
R² = 0.9932
2500000
2000000
1500000
1000000
500000
0
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18

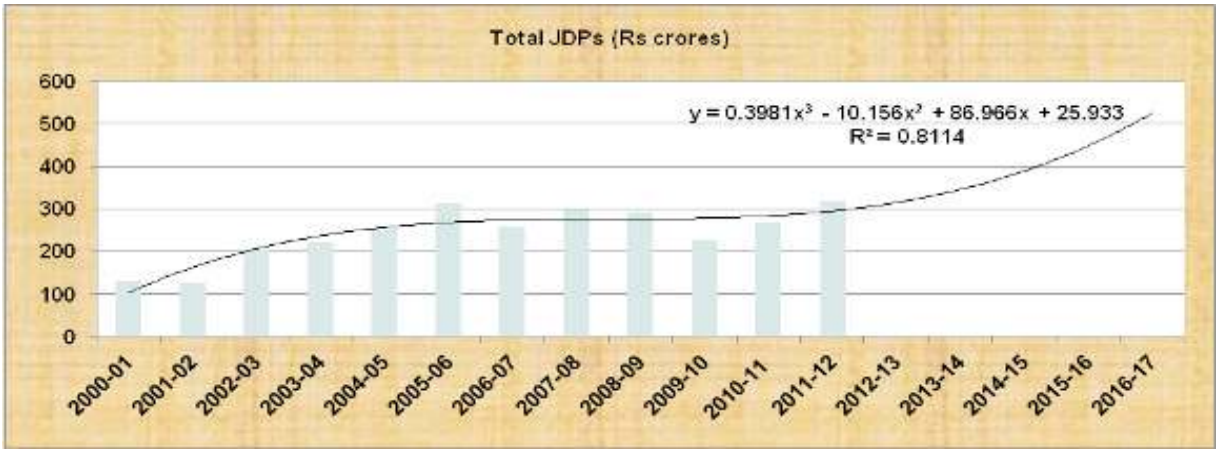

Decorative Fabrics (Rs crores)
y = 0.1187x² - 1.3951x + 5.6582
R² = 0.52
18
16
14
12
10
8
6
4
2
0
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17


GIFT ITEMS MADE-UP OF JUTE QUANTITY (KGS)
y = 14405x² + 232.4x + 65248
R² = 0.6184
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18


Gift Articles (Rs crores)
y = 0.0238x³ - 0.4866x² + 2.8004x - 2.2815
R² = 0.3125
25
20
15
10
5
0
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17







Increasing trend were observed in case of floor covering and shopping/hand bag export earnings over the last decade and showed bright prospect in near future. Whereas other jute diversified products showed decreasing trend indicating the changing preferences of consumers attitudes towards these items. In case of gift article, it showed constant export performance over the years. However the total JDP export showed desired upward trend and vivid bright future for the exporters.

Remarks:

Jute constitutes a low proportion of the value of world trade, but its cultivation and processing is labour-intensive and therefore provides a livelihood and an important source of food security to many farmers and their families in India. Diversified jute products, such as geo-textiles, floor coverings, hand & shopping bags, wall hangings and other gift items & decorative fabrics are also manufactured in relatively smaller quantities. However, their share in the value of total exports is rising. Globalization has opened up enormous number of new markets and enormous numbers of new competitors for jute diversified product manufacturers.

Production and commercialization of value added jute products would create additional employment opportunities and assist in alleviating poverty. Production of diversified jute products increased through medium and small sector entrepreneurs, NGOs, SHGs, WSHGs and individual manufacturers.

All India Network Project

AINP-1.01 Quality evaluation of Jute and allied fibres under various agricultural trials

Dr. S. C. Saha, Shri A. Ghosh & Shri A. Sarkar

Jute, Mesta & Sunnhemp fibre samples grown under different agronomical conditions at CRIJAF and participating research centres were received under this network project. The break up for the different fibre samples are given below:

Entries	No. of samples tested in 2013 - 14
Capsularis jute	76
Olitorius jute	76
Roselle (Bimli)	06
Kenaf	-
Sunnhemp	22
Total	**180**

Strength and fineness values of all the samples for grading of jute and mesta fibre samples were carried out. Dr. S. C. Saha, A. C. T. O, NIRJAFT, Kolkata presented the results of fibre quality trials of fibre samples obtained from various AINP centres in the 11th Annual Group Meeting of AINP 2013-14 held at UBKV, Coochbehar. Dr. D. Nag, Director, NIRJAFT chaired Fibre Technology Session. Dr. K. Monoharan, Director, Directorate of Jute Development and Dr. G. Roy, Head, QE&I Division of NIRJAFT were co-chairmen of the session. Rapporteurs were Mr. Arindam Ghosh, T.O and Mr. Amitava Sarkar, T.A., NIRJAFT, Kolkata.

Observations:

1. Fibre samples sent by many centres contained large amount of defects.
2. In most of the cases, *Capsularis* samples were weak in strength but very fine.
3. A few centres sent samples with root portion cut.

The following suggestions emerged in the session regarding sending of samples by AINP Centres:

- To tag the samples in a proper way
- To use better quality of aluminum foil for tagging the samples
- Samples not to be sent in haphazard manner and pack each project samples in a separate packing.
- To supply full information about project no. including V-1, V-2 etc. but in separate sheet within the samples pack.
- Not to cut the root portion of the samples.
- Not to send extra samples which is not in the AINP project
- All the centres to supply the details of harvesting time, retting time, etc., which are essential for correct analysis of the results.
- To send the samples within 2nd week of October so that testing may be done before AINP Annual Meeting.

Externally Funded Projects

Achievements

- Development of computerized instrument for testing bending behaviour of technical textiles

- Yarn diameter, diameter variation, thick, thin, neps and hairiness parameters measured successfully in running condition by low cost image processing technique.

- Use of nano-silver as an anchoring agent at lower concentration in order to improve the interfacial adhesion of polyester resin for the improvement of performance of jute fabric-thermoset resin biocomposite.

- Development of Jute bio-composite using modified lac matrix

- Development of Coconut fibre retting technology

- Digitization of NIRJAFT Library Management System using KOHA open source software.

MM 4/ 6.2 Development of Electronic and Microprocessor based Integrated Instrument for Jute Grading System

Dr. G. Roy

The main objective of this project was to develop an integrated system consisting of hardware and software units to score the grade of the Jute sample accurately.

The integrated unit of the system contains the following organs:

1. A hardware/software unit with computer interface to measure and store the value of fineness of the fibre in tex.
2. A hardware unit with computer interface to measure and store the strength value of the fibre in g/tex.
3. A software unit to check the defects and root contents present by image processing technique of the scanned image of the fibre.
4. A hardware-software unit to find the density of the fibre.
5. A hardware/software unit with computer interface to measure and store the colour with respect to whiteness value of the fibre.
6. From all of these values, the grade score and type will be computed and displayed using Artificial Intelligence system.
7. After the development of the complete system, training and marketing will be done to the tentative users.

Beside these, a moisture measurement unit is also present which will indicate the moisture content, moisture regain value of the jute sample under test. It also indicates the Relative Humidity of the environment.

Present status: The instrument is complete in all respect. But, a small problem exists in the strength management unit which will be rectified soon.

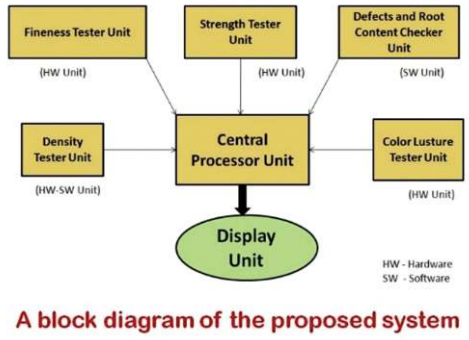


Fig. 1 - A block diagram of the proposed system

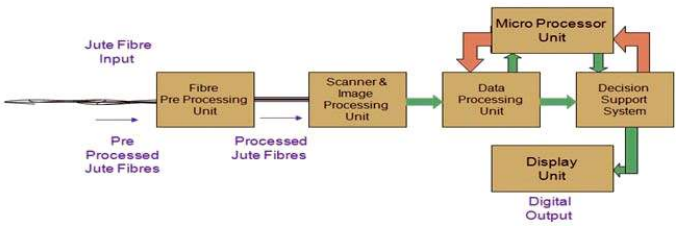


Fig. 2 - Work Flow Diagram

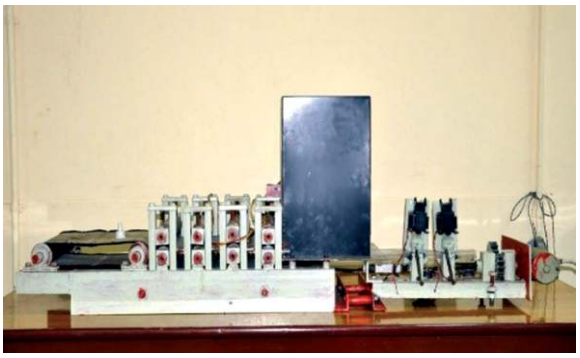


Fig 8 - Complete Instrument

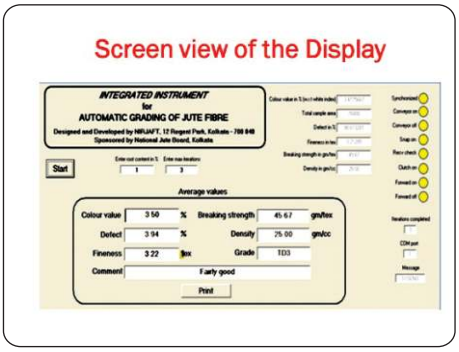


Fig. 9 - Screen view of Output

IDP/IND/2010/19 Design & development of computerized instrument for testing bending behaviour of semi-rigid fabrics with special reference to technical textiles

Dr S Sengupta

We are very much concerned about the linear extension of fabric under loads applied along the fabric axis. The influence of vertical forces which built up a torque on a fabric like bending is also interesting and has practical importance. At present, four principles are known for bending test i.e. (a) Cantilever technique (b) Hanging loop technique (c) Heart loop technique and (d) Circular bend technique. The first principle has been commercialized internationally and tester is also available. This method is manual and hence, there is chance of error. It requires mathematical calculation separately to determine flexural rigidity. They give rigidity data for a particular bending in static condition. This data cannot show the nature of bending behaviour in dynamic condition i.e. the change of rigidity with change of bending. Such information is required especially for technical textiles. Hence an attempt has been made to develop a system to study the complete behaviour of bending specially for technical textiles.

Features/ Specifications of the instrument

(I) Motorised movement of jaw causes fabric deflection (ii) Electronically/computerised control operations and settings (iii) Computerised calculation, display and data storage (iv) Digital display of bending load and deflection during test (v) Dynamic bending behaviour can be studied (vi) Better accuracy as manual operation totally eliminated except mounting of samples. (vii) Suitable for wide range of fabrics (specially for technical textiles, semi-rigid fabric, nonwoven, canvas etc) (viii) Suitable for ropes also (ix) Output data and graphs as : (a) bending stress in specified deflection, (b) bending load-deflection curve, (c) cyclic bending graph, (d) Bending resilience, (e) Bending stress relaxation, (f) deflection left after any cycle. (x) Statistical calculations like mean, median, mode, Standard deviation and coefficient of variation are available.

Fig. 1 - Front view of the instrument

Conclusion

Complete information of flexural behaviour can be tested in the developed instrument with better accuracy, as manual operation is totally eliminated except mounting of samples. It shows reliable and repetitive results. This instrument is user friendly, low cost, informative and essential for technical textiles.

IDP/IND/2010/25 Development of an efficient staple yarn characterization unit with multi sensor fusion and field Programmable gate array (FPGA) based data reduction card

Dr A Sengupta, Dr. S Sengupta*

** IIEST, Shibpur, Howrah*

The development of a computerised system to measure different yarn parameters i.e. diameter, diameter variation, number of thick/thin places and neps, hairiness indices (hair length index and hair area index) and number of hairs in a single run with the help of image processing has been done. A low cost Universal Serial Bus (USB) web camera, mechanical set up for yarn movement, computer and LabVIEW software are used for this purpose. Jute and cotton yarn with wide range of nominal diameter have been tested with cut length 1 to 4 mm and the results have been compared with a commercial capacitive tester i.e. Uster tester 3. The repeatability of results is insignificant in 1% level. Calibration has been done by taking image of a standard wire and adjusting the multiplying factor in the software if required. The developed system can give the average diameter of the yarn under test in real time unit (millimetre) unlike state of art instrument where it is set to zero. Hairiness is more rigorously defined in contrary to other tester where either qualitative analysis of hairs or hair count is measured. As the principle of measurement is image processing, the choice of correct background prior to the test is a prerequisite. The accuracy of the developed instrument is much higher as it can sense pixel change of measurable parameter. The developed system is equally useful for coloured yarns with proper background. The performance of the system is free from fluctuation of ambient temperature, humidity and illumination level.

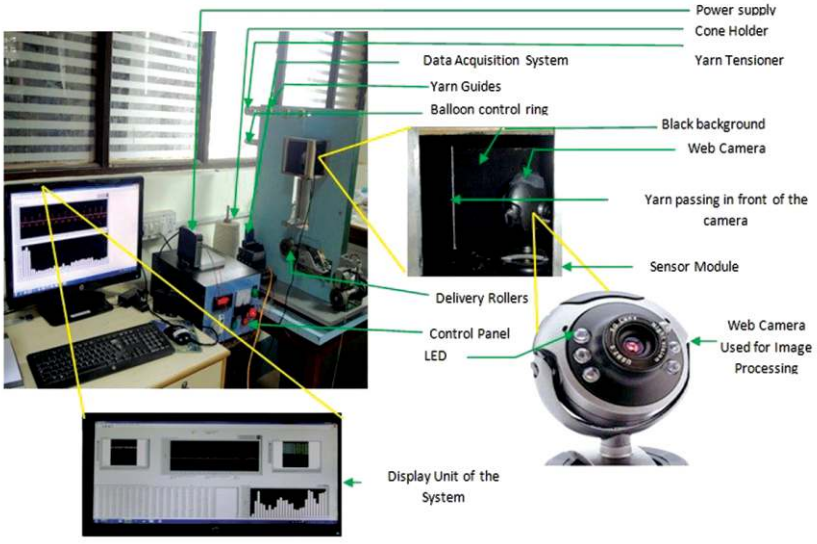


Fig. 1 - Developed instrument.

FQ3029 Jute based biocomposites for industry

Dr. P.K.Ganguly , Dr. L. Ammayappan , Dr. S. Debnath, Dr. D.P. Ray

Chemical modification of jute fabric with NaOH treatment

Plain jute fabric was pretreated with 1%NaOH (w/v) solution in presence of 0.1% non-ionic detergent solution at different time (30, 60 & 90 minutes), temperature (30, 40 & 50°C) and MLR (1:04, 1:10 & 1:15) as per orthogonal array method. NaOH treated jute fabric were characterized by % weight loss, FTIR, pXRD, TGA and SEM. FTIR spectrograph shown the disappearance of the peak responsible for hemicellulose and lignin, TGA thermograph shown there is a slight reduction in the peak responsible for hemicellulose and SEM shown defibrillation of the jute fibre. Results inferred that sodium hydroxide treatment leads to removal of partially hemicellulose, lignin so that there is improvement in de-fibrillation, crystalline region, orientation of microfibril, thermal stability and reduction in hydrophilicity.

Biocomposites were prepared from NaOH treated jute fabric and unsaturated polyester resin (UPR) by hand laying method. Biocomposites were evaluated for their tensile strength (TS), Tensile Strain (TS_n) flexural strength (FS), flexural modulus (FM), Initial Modulus' (IM) interlaminar shear strength (ILSS) and fibre load (FL) From the results, it is inferred that biocomposites prepared from jute fabric treated with 1% NaOH (owf) at MLR = 1:10; 50°C temperature for 60 minutes shown better properties than others and it considered as optimized condition with sufficient reduction in void(%) content, which inferred that there is good adhesion between resin and NaOH treated jute fibre.

Table 1 - Properties of composites.

Sample	FS (Mpa)	FM (Gpa)	ILSS (MPa)	TS (N/mm^2)	IM (MPa)	FL (%)	Density (g/mm^3)	Void (%)
Control	66	3.0	4.1	38.9	3.8	36.0	1.10	14.5
Optimized condition	81.4	4.4	13.0	42.7	5.1	40.1	1.19	8.5

H_2O_2 treatment of jute fabric

To increase the compatibility between jute fibre and polyester resin, H_2O_2 bleaching treatment at 1, 2, 3 & 4% (owf) for 60 minutes was given to plain and twill jute. SEM photograph shown that increase in surface crimp with increase in concentration of H_2O_2, which might also lead to increase in the surface area of the jute fibre for intimate contact with the resin. It is also observed that increase in H_2O_2 concentration, the whiteness the jute fabric was increased due to partial removal of hemicellulose, coloring matter as well as lignin. FTIR spectrograph shown the disappearance of the peak responsible for hemicellulose and lignin. Tensile strength results inferred that increase in concentration H_2O_2, there will an increase in tensile strength up to 3% and then reduction, which might be due to maximum

removal of hemicellulose and lignin at higher concentration along with weakening of cellulose chain by the bleaching agent. The pXRD analysis also confirmed that there is an increase in the crystalline region up to 3% H_2O_2 followed by reduction at 4% H_2O_2. Results inferred that H_2O_2 treatment leads to improvement in de-fibrillation, crystalline region, orientation of microfibril, thermal stability and reduction in hydrophilicity.

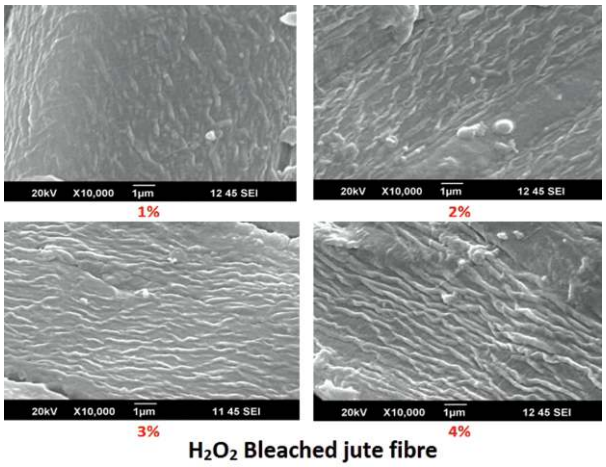


Fig. 1 - H_2O_2 Bleached jute fibre

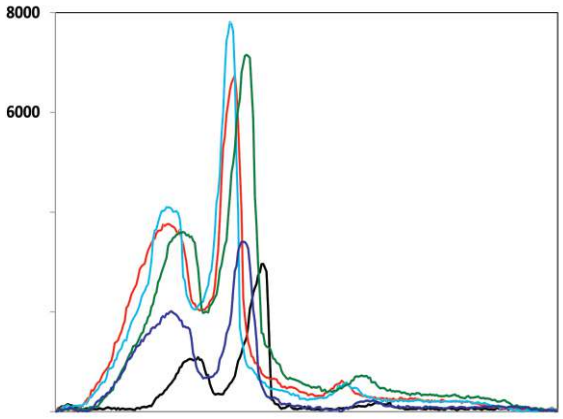


Fig. 2 - pXRD of bleached jute fibre

H_2O_2 treatment might remove the some portions of hemicellulose, lignin, and adhered impurities like wax, pectin etc., and the modified jute fabric had defibrillation with improved crystalline region so, this treatment enhances the mechanical properties of the biocomposites. 3% H_2O_2 treated Jute: USP based biocomposite shown better improvement in mechanical and flexural properties than other conditions and they shown improvement in Initial's modulus @ 68%; Flexural strength @ 28%; flexural modulus @ 57%; ILSS @ 98%; FL @ 4 with 4% reduction in tensile strength in comparison with biocomposites from untreated jute fabric

Table 2 - Properties of bio-composites

Treatment	TS (N/mm^2)	TSn	IM (MPa)	FS (MPa)	FM (GPa)	ILSS (MPa)	FL (%)
Untreated	38.9	2.0	3.8	66	3.0	4.1	36.0
1	37.9	1.8	6.4	65.4	2.6	7.9	40.4
2	37.2	1.7	7.4	78.5	4.5	7.3	38.3
3	**37.4**	**1.9**	**6.4**	**84.2**	**4.7**	**8.1**	**37.7**
4	38.7	1.7	6.0	71.5	3.6	8.0	37.9

Physical modification of jute fabric with dry heat treatment

To increase the compatibility between jute fibre and polyester resin, dry heat treatment at 120, 130, 140 & 150°C for 120 minutes was given to plain and it will jute and put in desiccator in order to prevent the

rapid absorption of moisture by jute fibre. SEM photograph shown that there is a rupture on the surface of the jute fibre which might lead to increase in the surface area of the jute fibre for intimate contact with the resin. It is also observed that increase in the dry heat temperature, the colour of the jute fabric was darkening due to thermal degradation of hemicellulose as well as lignin. Up to 140°C, dry heat treatment improved the tensile strength of jute fabric and then the strength is reduced. The pXRD analysis also confirmed the increase in the crystalline region up to 140°C followed by reduction at 150°C.

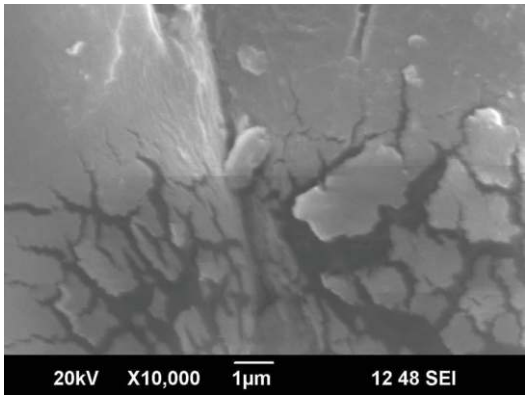


Fig. 3 - SEM of dry heat treated jute fibre (130°C)

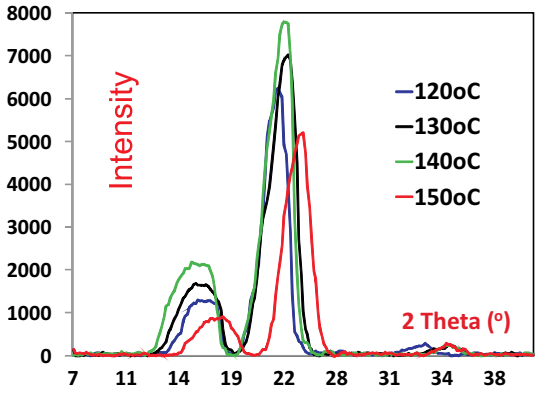


Fig. 4 - pXRD of dry heat treated jute fibre

Dry heat might degrades some portions of hemicellulose, adhered impurities like wax, pectin, sizing materials etc., and the degraded materials acts as fillers for the reinforcement resin. 130°C/140°C dry heat Jute: USP based biocomposite shown better improvement in mechanical and flexural properties than other conditions. they shown improvement in tensile strength @ 22%; Initial's modulus @ 49%; Flexural strength @ 42% ; flexural modulus @ 93% ; ILSS @ 51%; FC @ 20% in comparison with biocomposites from untreated jute fabric

Table 3 - Properties of composites

Treatment	TS (N/mm^2)	TSn	IM (Mpa)	FS (Mpa)	FM (Gpa)	ILSS (Mpa)	FC (%)
Untreated	42.7	2.0	4.0	66	3.0	4.1	36.0
120° C	45.7	1.4	4.6	68	2.8	4.6	43.6
130° C	49.3	1.3	5.6	94	5.8	6.2	43.2
140° C	51.9	1.2	5.9	90	5.2	4.8	43.7
150° C	43.6	0.9	6.7	90	4.3	4.8	45.4

Modification of jute reinforcement with nano silver

Nanosilver particle was deposited on jute fibre by in-situ synthesis method with with five different concentrations of silver nitrate solution (1.25, 2.5, 5.0 and 10.0 mM) for the modification of jute fiber as

an anchoring as well as fillers agent. The formation of nanosilver was confirmed by PXRD, SEM with EDX and FTIR methods.

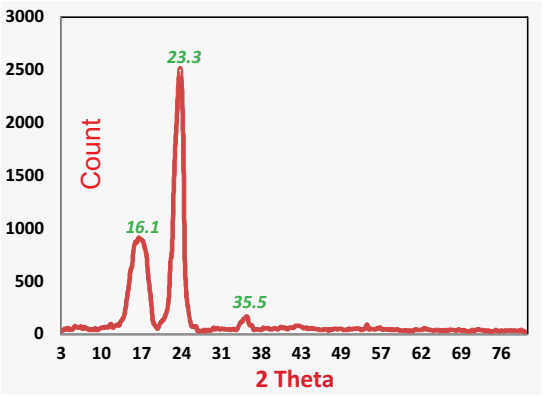


Fig. 5 - pXRD graph of untreated jute fibre

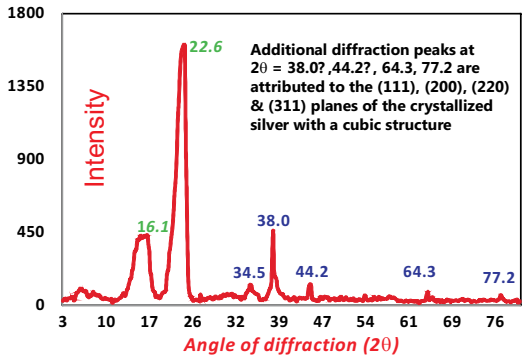


Fig. 6 - pXRD graph of nano silver applied on jute fibre

Flexural strength of nanosilver modified jute based biocomposites shown 10-13% higher value than control biocomposites up to 2.5 mM $AgNO_3$, and then drastically reduced. In case of flexural modulus, the same trend was observed i.e. nanosilver modified jute based biocomposites shown nearly 125% higher value than control sample. The improvement in flexural strength may be attributed to anchoring effect of nanosilver between fibre and matrix along with increase in orientation of cellulose polymer chain by intermolecular bonding by nanosilver. Statistical analysis inferred that increase in concentration of $AgNO_3$ will reduce the flexural property and it shown highly significant result i.e. $R^2 = 0.9931$ and $R^2 = 0.8247$ for flexural strength and flexural modulus respectively.

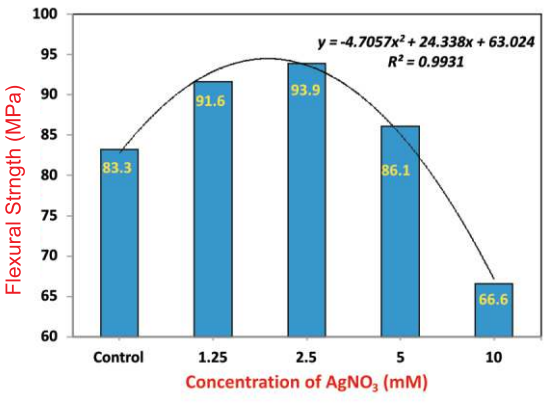


Fig. 7 - Flexural strength

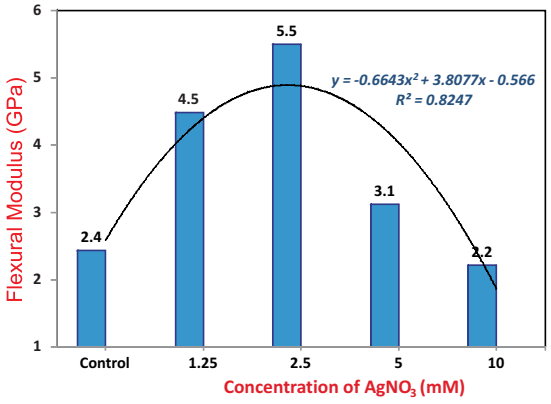


Fig. 8 -Flexural modulus

It is found that at lower concentration of $AgNO^3$ (< 2.5 mM), biocomposite shown very good mechanical properties with simultaneous reduction in % void content than control biocomposites. Results inferred that nano-silver could be used as an anchoring agent at lower concentration in order to improve the interfacial adhesion of polyester resin for the improvement of performance of jute fabric-thermo set resin biocomposite.

Table 4 - Effect of $AgNO^3$ on biocomposites.

$AgNO_3$ mM	Jute fibre %	USP resin content %	Nano silver content %	Theoretical density gm/cm^3	Actual density gm/cm^3	Void content %
Control	42.30	57.70		1.31	1.14	12.7
1.25	45.73	54.19	0.079	1.32	1.18	10.7
2.50	43.52	56.32	0.162	1.32	1.22	7.8
5.00	44.60	55.08	0.318	1.34	1.23	8.3
10.00	41.10	58.28	0.615	1.36	1.23	9.6

Characterization of lac and modified lac, lac-rosin based formulation

Films of shellac, treated with urea, thiourea and maleic anhydride in aqueous and alcoholic media, were developed at IINRG, Ranchi. Improvement in thermal properties of lac was observed on treatment with the cross-linking agents.

Preparation of a lac and modified lac based formulation

Shellac modified with urea, thiourea and maleic anhydride, binder formulations to be used as matrix for jute based bio-composites were prepared. Formulation comprising in solvent media (lac, lac-urea, lac-thiourea and lac-maleic anhydride) and in aqueous media (lac, lac-urea, lac-thiourea and lac-maleic anhydride) were prepared for composite.

Development of Jute bio-composite using lac and modified lac matrix

Jute based bio-composite with 2, 3 and 4 layers from above these 08 types of formulations were successfully developed in sizes 6" x 6" in carver lab press and 12"x 12" in bigger press at 130-150°C and pressure of 5 ton load. The density of composite boards were ranging from 0.82-1.07 gm/c.c. Highest matrix loading 46% was observed in modified lac-thiourea based biocomposites. Flexural modulus of green composites was ranged from 1.98 to 5.99 GPa with Lac-thiourea modified biocomposite having highest modulus in comparison to others. Interlaminar shear strength (ILSS) ranged from 3.59 to 7.65 GPa with Lac-urea modified biocomposites having highest strength in comparison to others. Flexural modulus varied from 3.06 to 5.59 GPa with Lac-urea modified biocomposites having highest strength in comparison to others.

Fq3029 Understanding genetics and biosynthesis of gum in ramie (*boehmeria nivea L. Gaud*) for developing low-gum genotypes.

Dr. Pratik Satya, Dr. D.P. Ray*

*CRIJAF, ICAR

Determination of gum content in decorticated ramie fibre

To determine the gum content in the decorticated ramie fibre, fibre samples were cut into pieces. 2g of sample was taken in a small weighing bottle. Mass of an empty weighing bottle containing a crucible

was taken. The 2g sample was dipped in 1% HCl for 30 minutes. The fibre was then washed with distilled water, followed by treatment with 1% NaOH for 1hour.Washing step was repeated and the sample was treated with 2% and 5% NaOH respectively for 1hour.Gum residue after each treatment was collected for further analysis .Finally the sample was washed with hot distilled water followed by acetic acid. The treated sample was transferred into G1 crucible along with weighing bottle and was kept in oven (at 110°C) for 4 hours 30 minutes and weight was taken. Alkali treated fibres were kept for FT-IR analysis.

Table 1 - Gum content in different ramie varieties

Sl No	Ramie Variety	Gum Content
1	R-1438	27.58 %
2	R-1416	21.05%
3	R 1429	24.52 %
4	R-1411	23.16 %
5	R-1424	23.37 %
6	50	27.74 %
7	R-1418	27.71 %
8	RH-1	26.52 %
9	R-46	25.78 %
10	R-1414	20.44 %
11	R-37	24.86 %
12	R 1410	21.61 %
13	R 1446	27.69 %
14	R 1447	26.19 %
15	R 1424	23.37 %
16	R 1419	22.92 %
17	R 1417	22.86 %
18	R 1418	27.71 %
19	R 1428	25.31 %
20	R 1429	24.52 %
21	R 1449	23.48 %

Novel method of degumming

A novel degumming method has been standardized for degumming of decorticated ranmie fibre. For this purpose polyvinyl alcohol was deployed in different concentration to standardized gum removal. The sodium hydroxide and polyvinyl alcohol combination were found to be most effective for degumming of ramie. In the following table the gum removal capacity of the combination has been elucidated.

Table 2 - Gum removal capacity of different concentrations of sodium hydroxide and Polyvinyl alcohol (PVA) solution

Ramie Varieties	Different Alkali Concentrations in g L^{-1}					
	5	10	20	30	40	50
TRS	18.61	22.32	23.08	23.69	22.73	23.66
RH-1	19.69	20.35	24.72	23.19	25.43	26.25
R-1419	14.92	19.30	18.06	18.12	21.21	17.65
R-1418	18.68	20.22	21.02	21.89	20.89	20.93
R-67-34	16.79	19.10	21.62	23.18	22.84	23.01
R-67-52	19.72	24.46	27.89	28.31	25.59	25.02
R 1450	14.88	15.78	20.21	18.84	16.71	19.55
Hakhui	17.01	20.33	21.46	22.45	21.37	22.16
Saikeshion	20.58	22.48	21.14	23.87	24.05	24.01

Development of suitable methodology for degumming of ramie

A comparative study was also undertaken to find the degumming ability of sodium carbonate and sodium hydroxide. It was found from our experiment that sodium hydroxide can effectively degum the decorticated ramie fibre than sodium carbonate at different concentrations.

Fig. 1 - Treatment of ramie.

Table 3 - Comparative Gum Removal Capacity of NaOH and Na_2CO_3 at Various Concentrations from Ramie (R-1411)

Concentration g L^{-1}	NaOH	Na_2CO_3
10	21.38%	12.44%
20	22.40%	14.46%
30	21.48%	13.45%
40	23.23%	13.79%
50	23.89%	16.46%

Comparison of Chemical Properties of two Ramie varieties

Chemical composition of two ramie lines has been compared through determination of different chemical parameters. While compared with TRS and R 1411, it was found that initial gum concentration was higher in TRS. The ash content was higher in R 1411. Holocellulose content was higher in R 1411 (96.10%) indicated superior fibre content in the line than TRS. In all the other parameters R 1411 showed better composition than TRS.

Table 4 - Comparison of Chemical Properties of two Ramie varieties

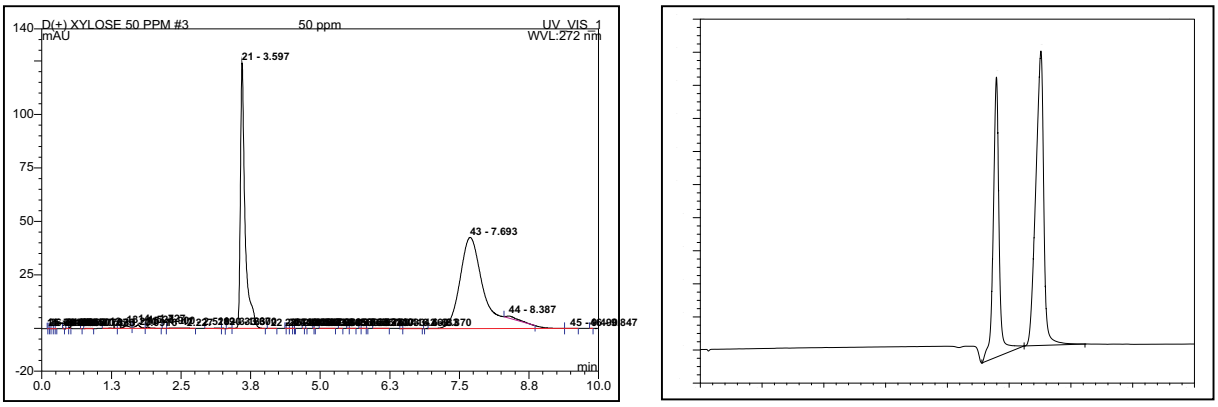
Chemical Components	TRS	R 1411
Gum content	23.81 %	23.15 %
Moisture content of defatted fire	13.63 %	12.78 %
Ash content	01.25 %	1.36 %
Fat and wax content	00.27 %	00.69 %
Holocellulose content	91.68 %	96.10 %
α-cellulose with respect to holocellulose	81.96 %	88.15 %
Hemicellulose content	9.72 %	7.95 %
Pectin content	3.95 %	3.52 %
Pentosan content	4.41 %	4.89 %
Lignin content	2.26 %	2.30 %

Hydrolysis of Sugar Components of Ramie Gum for HPLC Analysis

For hydrolysis of ramie gum, 100 mg gum samples was taken in a test tube and 1 cc of 77% sulphuric acid was added into it. The test tube was kept as it is for 45 minutes to one hour on ice. It was then transferred to a 100 ml round bottom flask and 39 cc of distilled water was added to it. It was then placed on boiling water bath and refluxed for 5 hours. The liquor was transferred to a 250 ml beaker. Barium hydroxide and barium carbonate powder was used to neutralize the solution. After neutralization it was filtered into a 100 ml volumetric flask and make up the volume.

Pure sugar solutions were being tried to standardize by using different mobile phase. By comparing the peaks of standard sugar solutions and ramie gum components we may be able to identify the sugar residues present in the gum. The HPLC chromatogram of the sugar molecules are presented herewith.

Fig. 2 - HPLC chromatogram of sugar fraction from ramie gum



Fibre quality of the degummed ramie

Degumming was carried out with different concentration of alkali and after degumming the fibre quality was evaluated. From the table below it can be revealed that the due to degumming of the fibre, the fineness has been improved. The reduction in tenacity percentage has been calculated and it was found that maximum reduction was observed at initial alkali treatment with 0.5% alkali. The fibre quality of the alkali treated ramie samples are presented in table below.

Table 5 - Quality of different treatment on ramie fibres

Sample	Tenacity g/tex	Percentage Tenacity	Reduction in percentage tenacity	Fineness tex
Raw fibres	22.80	100	-	1.20
0.5 % alkali treatment	15.90	69.74	30.26	1.00
1 % alkali treatment	16.90	74.12	25.88	0.90
2 % alkali treatment	16.80	73.68	26.32	0.70
3 % alkali treatment	17.60	77.19	22.81	0.80
4 % alkali treatment	17.60	80.26	19.74	0.90
5 % alkali treatment	18.30	70.18	29.82	1.00

Bleaching of R-1411

The ramie fibre was boiled with 1% NaOH solution for 1 hour. After washing the fibre with distilled water and neutralizing with acetic acid, 50 g of ramie fibre was taken in a spoutless 1 L beaker in a liquor ratio of 1: 25. 0.5% of sodium dihydrogen orthophosphate ($NaH_2PO_4, 2H_2O$), 1% of sodium silicate (meta) pentahydrate ($Na_2SiO_3, 5H_2O$) and hydrogen peroxide (1 cc/100ml) was added. It was boiled for 2 hours. The fibre was washed in clear water

Fig. 3-Fibre ombed

FT-IR study of the degummed fibre

A few samples of the above lot were taken for FT-IR study and spectral analysis indicated that treatment with sodium hydroxide causes gum removal at a higher rate.

Non-conventional Chemical Degumming Technologies of Ramie Fibre

- Ramie fibre was degummed with 8 % sodium hydroxide only
- Ramie fibre was degummed with 8 % sodium hydroxide + polyvinyl alcohol + sodium chloride
- Ramie fibre was degummed with 8 % sodium hydroxide + sodium chloride
- Ramie fibre was degummed with various concentrations of sodium hydroxide under high pressure
- Ramie fibre was degummed with sodium hydroxide, sodium sulfide and sodium carbonate in a specific ratio, under pressure.

pXRD study of Ramie Fibre

To study the purity as well as crystallinity, degummed ramie fibres were sent to pXRD studies. The following graphs revealed that the ramie fibres extracted through chemical degumming in good crystalline shape. The big peak indicates the purity/ crytallinity of ramie. The peak at the right side indicates the amorphous region revealed minimum presence of gummy hemicellulosic materials in ramie.

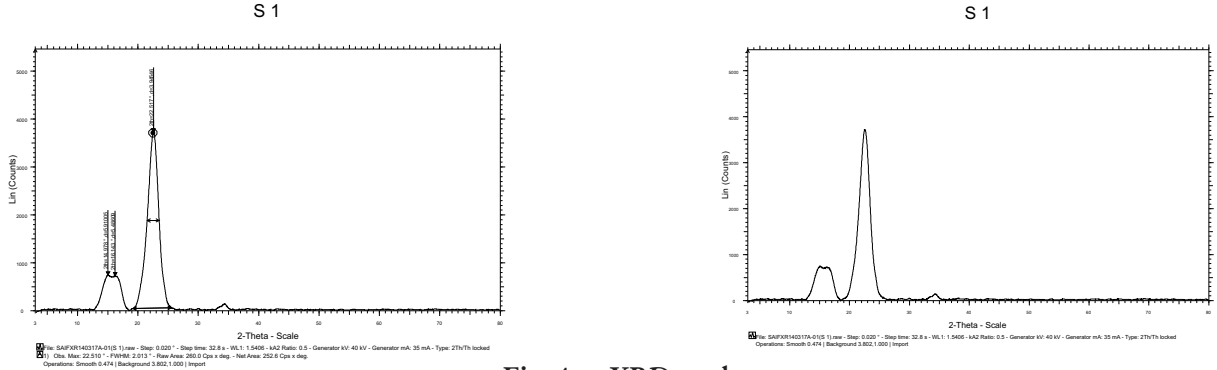


Fig. 4 – pXRD study

JTM MM-III Evaluation and Demonstration of high capacity Power Ribboner for Extraction of Ribbon from Jute and Mesta Plants

Dr. V. B. Shambhu, Dr. P. K. Ganguly, Mr. P. Sanyal & Mr. P. Chaudhuri

Jute and mesta are the two important fibre crops in India next to cotton and both crop fibres are used in textile and related industries. Conventionally, fibres of these crops are extracted from the bark or bast of the plants after retting the harvested whole plants. Retting is the single most critical step which largely contributes to the quality of fibre. Cost as well as energy analysis of cultivation of these crops showed 2nd major consumption in the process of fibre extraction.

NIRJAFT Power Ribboner for extraction of ribbon from jute and mesta, has been designed and developed considering the need for use in jute and mesta fields. It is powered by a 1 H.P. electric motor or an engine of equivalent capacity. The machine works on the principle of stripping of green ribbon/barks from the harvested stem/canes without breaking the inner woody stick. The green bark/ribbon peeled off from the whole jute plants can be conveniently retted in much less volume of water to yield quality fibre of high grade compared to the conventional method.

The machine comprises of two pairs of fluted rollers mounted on shafts with parallel staggered axis on a pair of the blocks. One rear fluted roller of each pair is spring loaded. The rollers of front shaft are driven by a single phase 230 V, 1440 rpm motor through belt pulley. A pairs of gears are fitted on the driver shaft, one gear after the driven pulley and another is at the end of the driven shaft. These gears are in mesh with another gear to actuate the other fluted roller to rotate synchronously. The reduction in speed has been done by V-belt pulley system for an optimum speed. When the machine is run, the rollers rotate at an optimum speed in opposite direction synchronously. The top surface of the machine is covered by metal sheet leaving only a slot just above the rollers for feeding the plants. The dimension of slot is provided in such a way that operator's hand cannot go in the slot. The length of the fluted rollers has been designed at present in such a manner that about 4-5 plants can be fed in the slot at a time. The belt pulley drive is covered by a guard for the safety of the operator. Defoliated green jute plants stems are fed into the slot on the top surface of the machine in a vertical position by the operator. The defoliated green plant can be fed from either its root or pinnacle end. As soon as the ends of the plants are gripped between the surfaces of the fluted rollers the plants are instantaneously brought down to horizontal position by which the stick is broken at the slot position and moves forward horizontally towards the other side of the operator. The green bark/ribbon peeled off from the plant is gripped simultaneously by the rotating fluted rollers and pulled it to down by pairs of rubber rollers which are mounted just beneath of fluted rollers and passes it on the delivery conveyor belt system. The machine extracts ribbons in full length without breaking the sticks in pieces. The variation in plant diameter is taken care by the spring loaded adjustment provided at the rear roller of each pair of the fluted rollers. The capacity of the machine would be 150-180 kg ribbons/h depending upon plant age, plant diameter, no of plants fed at a time and on the skill and experience of the operator.

NIRJAFT Power Ribboner Machine for Extraction of Fibres from Jute & Mesta Plants

NAIP Component I Zonal Technology Management and Business Planning and Development Unit at NIRJAFT

Dr. A N Roy, Dr. A K Roy, Dr. S N Chattopadhyay & Dr. S B Roy

NIRJAFT ZTM-BPD unit organised two Agri Business meet at NIRJAFT where 9 MOU and 3 MOA were signed with different entrepreneurs on NIRJAFT technologies as well as technologies of different catchment institutes under ZITMC, East Zone as tabulated below.

Table 1 - Commercialization of technologies of NIRJAFT and some catchment institutes of east zone ZTMC as detailed below:

S. No.	(Process/Product/Technology Developed/Commercilised	Adoption/ Validation/ Commercialization, etc.	Responsible Partner
1	Jute Stick Particle Board	MoU Signed with Trishna Jute Private Limited	BPD-NIRJAFT
2	Jute based Handmade Paper	MoU and MoA signed with Kalighat Society for Development Facilitation	BPD-NIRJAFT
3	Designer Jute Bags	MoU and MoA signed with Tru Blu International	BPD-NIRJAFT
4	Jute based Decorative Yarn	MoU and MoA signed with Ecodev Consultancy Private Limited	BPD-NIRJAFT
5	Jute based Decorative Handloom Fabric	MoU and MoA signed with Ecodev Consultancy Private Limited	BPD-NIRJAFT

6	Jute based Decorative Handloom Fabric for Dress Materials	MoU and MoA signed with R B M Industries Limited	BPD- NIRJAFT
7	Jute based Decorative Yarn	MoU and MoA signed with Fulia Women and Youth Welfare Society	BPD- NIRJAFT
8	Tomato Seed variety Swarna Sampada and Brinjal Seed Variety Swarna Shakti	MoU is signed Sabuj Shakti Agro Revolutions, Chinsurah (Hoogly): 712 102	BPD- NIRJAFT in association with ICAR Research Complex for Eastern Region, Ranchi
9	Production of Wine from Litchi Fruits	Sreehari fabricators, Plot No D 8 and D 9, Industrial Estate, Bhathu Basti, Port Blair: 744 105, Andaman and Nicober Islands	BPD- NIRJAFT in association with NRC on Litchi, Muzaffarpur
10	Technical support for implementation of wet processing technologies and other NIRJAFT technologies for jute diversified product development in West Bengal	Margdarshak Development Services, Gr. Fl., 137 Jodhpur Gardens, Kolkata 700045	BPD- NIRJAFT
11	Human Resource Development, Technical support for spinning jute and allied fibre, Quality Management for setting quality standards and JDP development	Revati Commercial Pvt. Ltd., Block A, Room No. 207, Annandaloke 2nd Fl., A J C Bose Rd. , Kolkata 700020	BPD- NIRJAFT

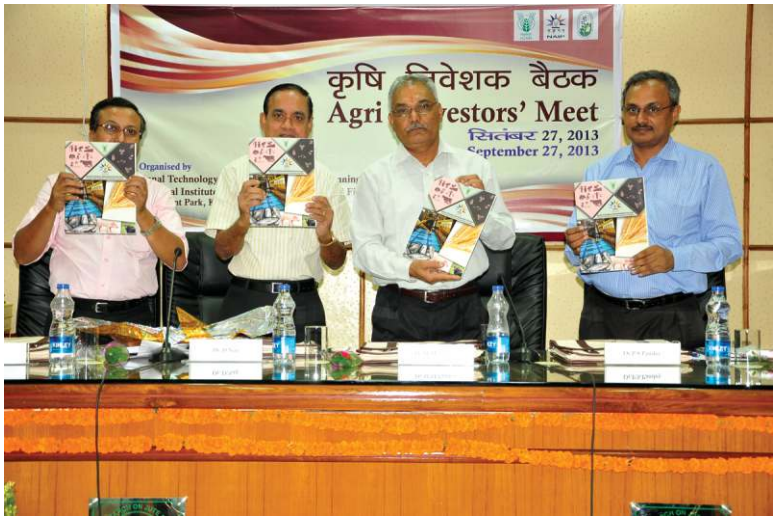


Fig. 1 - Agri Business meet at NIRJAFT

NIRJAFT organised four Agribusiness Camps - One each at NRC on Orchid, Packyong, Sikkim; CARI, Portblair, Andaman & Nicober island; NRC on Yak at Dirang, AP and ICAR Research Complex for NEH region at Barapani, Meghalaya. Participated in four different exhibitions, one farmers' fare, three workshops and two business meet where some technologies of our institute and products of three of our incubates were showcased.

Fig. 2 - Agribusiness Camp at NRC on Orchid, Packyong, Sikkim

Fig. 3 - Agribusiness Camp at CARI, Portblair, A & N Island

Fig. 4 - Agribusiness Camp at NRC on Yak at Dirang, AP

Fig. 5 - Agribusiness Camp at ICAR RC for NEH region at Barapani

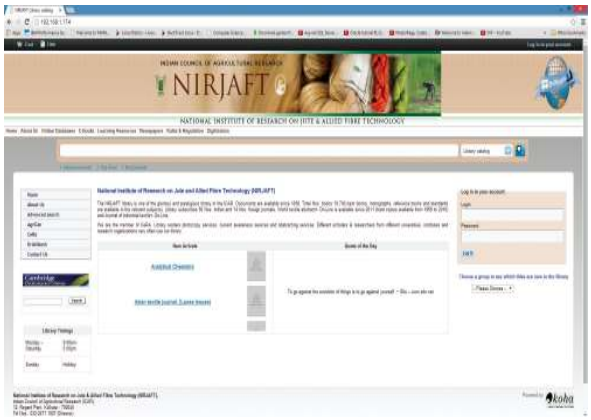
NAIP COMPONENT I Strengthening of digital library and information management under NARS (e-GRANTH)

Dr. Sambhu Nath Chattopadhyay and Dr. (Mrs) Rina Naiya

One server and two computers were procured and installed. KOHA library management software was installed on DEBIAN. Bibliographic information of all our library books were entered in KOHA and the entries of bound volume are in progress. Rules have been framed and lilbrary membership cards of all the staffs of NIRJAFT have been produced using KOHA library management software. One sensitization workshop was organized on 20.12.2013 at NIRJAFT where all the staffs of NIRJAFT

were participated and gather knowledge regarding the advantage of library management system digitization using KOHA open source software. A considerable number of books has been digitized and sent to IARI for inclusion in KRISHI KOSH. NIRJAFT publication since inception has been sent to IARI for inclusion in KRISHI PRABHA. Designed OPAC screen for NIRJAFT and circulation of library documents has been started using KOHA library management system. Now NIRJAFT library management system is totally digitized. Second workshop was organized on 28.03.2014 where all the staff members of NIRJAFT were informed how to use the NIRJAFT library resources using new online system.

The Dignitaries sitting in the dais during inaugural session of the workshop.



OPAC (Online Public Access Catalogue) page of NIRJAFT Library.

NAIP COMPONENT II A value chain on coconut fibre and its by-products: Manufacture of Diversified Products of higher value and better marketability to enhance the economic returns of farmers.

Dr. G. Bose, Dr. A. N. Roy, Dr. S. Sengupta, Dr. S. Debnath

In the reporting period two training programs and one CAC, CIC meeting were organized under the sub project. A monograph "Coconut Palm (*Cocos nucifera L*) Descriptor, Variety: 2F Coconut Palm Bio-industrial Group" and a leaflet "Chemical Retting of Coconut Fibre: A Novel Technology of Rapid Retting for Raw Coconut Fibre", in English, Hindi & Oriya were published. The project ended on 31st December, 2013. The final report of the project submitted containing the review of the research output and achievements. The details of two training programs are given below.

Training cum workshop program on coconut fibre & jute-coconut fibre blended hand spun yarn conducted in Shankartala Village Malda district, West Bengal

Training cum workshop program on 100% coconut fibre & jute-coconut fibre blended handspun yarn

was conducted on 18.12.2013 in Shankartala Village, for a duration of ten days. The main objective of the training program is to develop skills for making rope from coconut fibre, jute and from their blends. The importance of conducting the training is to enhance economical aspects and future prospects of people engaged to coir sector. The training programme was supervised by a research team consists of Dr.Sanjoy Debnath and Mr. Seiko Jose. Sixteen enthusiastic members were participated from the village.

Entrepreneurship Development Programme on Captive Retting of Coconut Fibre

Entrepreneurship Development Programme on 'Disintegration, Defibering of Husk, Segregation & Captive Retting of Coconut Fibre', was held on 5th and 6th of Dec 2013 in Mahila Katthya Kamgar Audyo Co-operative Society Ltd., Vengurla, Maharashtra, conducted under NAIP, comp. - II, in collaboration with Central Institute for Research on Cotton Technology (CIRCOT), Mumbai. The main objectives of the programme were to sensitize the participants about coconut value chain technology, to create awareness among entrepreneurs about different avenues for financial support and to motivate the participants for business incubation at ZTM-BPD-CIRCOT. Delegates from different organization were present in the program. Dr. K.K Satapathi (Ex-Director, NIRJAFT), Dr.S.K.Chattopadhyay (Director Acting -CIRCOT), Dr. Gautam Bose (Principal scientist-Mechanical Processing Division, NIRJAFT and CPI- NAIP-II), Dr. S.K. Dey (Senior scientist, CIRCOT), Mr. Rajkumar (IRMRA), Mr. M.K.Gawde (Chairman, Mahila Katthya Kamgar Audyo Co-operative Society Ltd., Vengurla), Mrs. P. Parab(Secreatary, Mahila Katthya Kamgar Audyo Co-operative Society Ltd., Vengurla) and other members were made the programme a remarkable incident. The society is currently engaged in defibering of coconut husk and making rope out of it. During this, lectures, demonstration and interaction were carried out by experts from various organizations, related to coconut fibre, its technology, processing and diversified products. Around 75 participants were present in the programme. Chemical retting of coconut fibre was demonstrated by Mr. Seiko Jose (Scientist, NIRJAFT). The main utility of this process is considerable reduction in time of retting process (from 10 months to 2 h) without polluting the backwater resources. Controlled

retting conditions of the technique soften the fibre without deteriorating its strength properties. The programme was reported by three local newspapers and audio visual media. The programme ensured to enhance the income of small scale entrepreneurs of that area by utilizing the technologies for value addition of coconut fibre.

Half-yearly workshop, CIC and CAC meetings on 15th - 18th November 2013

CAC, CIC meeting cum review workshop program was held on 15th - 18th November 2013. All the consortium partners of the sub project presented their research work to reassess their achievements and excavate the gaps and loop holes in creating coconut fibre value chain. The session was chaired by Dr. Swadesh Kumar Sett. There were around 70 participants from NIRJAFT and other ancillary institutes/enterprises attended the workshop.

NAIP COMPONENT III Sustainable rural livelihood empowerment project for northern disadvantaged districts of West Bengal.

Dr. S. Debnath

Trainings on weaving of Cotton towel and jute doormat using handlooms have been conducted. Villages from Malda region of West Bengal of cluster-III have been undertaken for implementation of the NAIP-III project.

The theme of the NAIP-III interventions at the mentioned region are to install handlooms and to impart training to the rural women for replacement of their age old weaving technology and introduce new jute based woven products besides their Dhokra for income generation. Jute is one of the major agricultural crops in these regions but due to lower profitability, farmers continuously losing their interest in jute farming. Keeping this fact in mind, to provide maximum profit to the jute farmers, 10 customized and fabricated handloom has been delivered and installed at the three villages of Mathurapur Block, Malda district, viz., Shankartala, Pulintala and Bhimtala. These handlooms are capable to produce jute door mats and different jute diversified fabrics, as well as cotton towel and other types of cotton fabrics. Among these villages, four handlooms were installed at Shankartala village and two trainings on "Weaving of cotton towel fabric in handloom" from 31.07.2013 to 14.08.2013 and 16.08.2013 to 30.08.2013 respectively. In each training 15 different farm women were participated. They all have shown a keen interest to learn and gain skills to manufacture different types of jute door

mats and co tton towels. Again, training on "Hand spun of coconut fibre & jute-coconut fibre blended yarn" has also been provided to 9 farm women and 7 farmers from entire Uttar Chondipur block from 18.12.2013 to 27.12.2013. Participants have learned to develop the coordination of hand and eyes which is very much required and the key factor to spin the coconut or jute-coconut blended yarns with precise rate and quality through hand spinning gadgets. This technology is much appreciated by them as because it was never been previously introduced to them at all. Apart from these, this technology can generate a stable income for jute farmers by making coconut or jute-coconut blended yarns.

With two handlooms two training related to handloom weaving have also been delivered at the Pulintala Village as follows: Training on "Towel Weaving in handloom" from 30.08.2013 to 13.09.2013 and "Weaving of Jute-Cotton Doormat in Handloom" from 14.09.2013 to 28.09.2013, and total 28 farmer women from different SHGs from Pulintala Village, take participation on these trainings. During the training period, trainees were efficiently learned to make different jute and cotton based fabrics and they also able to put some creative designs on them. They are hopeful as these fabrics have good market potential at the local areas. This will provide a good returns as it also can create an opportunity for a steady source of income generation in their leisure time.

Bhimtala is the third village of Malda District, where four handloom and accessories haves been installed. Two trainings have been conducted with the installed handlooms. The first training was on "Weaving of Cotton Towel in Handloom" from 15.11.2013 to 29.11.2013 and on "Weaving of jute based door mat in handloom" from 13.12.2013 to 27.12.2013. In total 30 days, 30 farmer women from different SHGs shows interest and participated to these trainings. They learn to operate and setting different machine parameters and finally able to produce different fabrics flawlessly. This technology is much appreciated by them as because it is basically value addition of jute fibres and the local demands of these products give them a huge scope to produce those items on industrial scale.

Institutional Activities

Research Advisory Committee Meeting

The XXIInd meeting of the RAC of NIRJAFT was held under the Chairmanship of Dr. B. C. Mitra, formar Director of NIRJAFT on May 15, 2013 in the BPD Hall. The meeting was attended by the members, viz. Dr. K. K. Singh, ADG (PE), ICAR; Dr. D. Nag, Director, NIRJAFT, Kolkata, Dr. S. M. Chatterjee, Ex-Vice Chancellor, BESU, Howrah, Dr. A. K. Samanta, Professor, Dept. of Jute & Fibre Technology, Calcutta University, Shri. A. K. Khastogir, Ex-Chairman cum Managing Director, JCI, Dr. Sunanda Chandra, Ex-Professor, ISI, Kolkata and Dr. N. C. Pan, Member Secretary & Principal Scientist, NIRJAFT, Kolkata. All Head of the Divisions, Scientists, and Technical Officers also attended the meeting as invitees.

Dr. D. Nag, Director, NIRJAFT in his inaugural address welcomed the members of RAC and briefly described the agenda of the meeting. The Action Taken Report of the 21st RAC meeting was presented by Dr. N. C. Pan. The Progress Report of divisional activities and the ongoing R&D projects were presented by respective Heads of the Divisions and concerned Principal Investigators. It was suggested by RAC that dry retting technology may be taken for large scale trial and popularization. The RAC also recommended that a proposal may be forwarede to BIS Authority to include the newly developed jute grading system in BIS standards. This was followed by presentation on Quinquennial Review (QRT) Team recommendations and action taken thereof by Dr. S.N. Chattopadhyay, Member Secretary, QRT. The Director, NIRJAFT presented the proposed SFC document. This was followed by presentation on new project proposals. It was suggested that research work on development of agro textiles suitable for mulching, seed bed, grass mat, horticultural pot and crop protection may be taken on top priority. Recommendations were made for development of a High Capacity Ribboner in collaboration with private manufacturers.

Institute Management Committee Meeting

The 65th Institute Management Committee meeting was held on May 28th, 2013 at NIRJAFT Committee Room under the Chairmanship of Dr. D. Nag, Director of the Institute. The meeting was attended by the members, *viz*, Dr. K. K. Singh, Assistant Director General (Process Engineering), ICAR; Dr. (Prof.) S. M. Chatterjee, Ex-Vice Chancellor, BESU, WB; Dr. S. D. Deshpande, Principal Scientist (AS & PE), CIAE, Bhopal, Mr. P. K. Nayek, AFAO, CRIJAF, Barrackpore, WB; Mr. Paritosh Bhattacharya, Director of Agriculture & Ex-Officio Secretary (Agriculture), GoWB; Prof. Asit Chakraborty, BCKV, WB; Mr. Rajeev Lal, Member Secretary, IMC and CAO, NIRJAFT, Kolkata. Heads of the Divisions, Incharges of different cells and AFAO of NIRJAFT were also presented in the meeting as invitees. The Chairman, IMC, welcomed all members to the meeting. The Member Secretary presented the proceedings of the 64th IMC meeting and Action Taken Report on the recommendation, in the meeting. The committee suggested for outsourcing of vehicle requirements of the institute on rate contract basis. The committee concurred with the Chairman,

IMC on the urgent need of relocation, renovation and up-gradation of the Institute museum as well as Library and recommended on completion of the work during current five year plan. The committee recommended the listed equipments for purchase which were the same as those on priority items of the 12th plan and recommended by RAC as well. Institute Grievance Committee (IGC) has been reconstituted. The committee also discussed on adoption of CGHS scheme for all categories of staff. On request of the IMC members, the chairman invited the Heads of Women Cell, Hindi Cell and Members of IJSC for interaction with IMC members regarding their functioning. Dr. P. K. Ganguly, Principal Scientist & Incharge, PME Cell delivered a presentation on Jute based composites for Industry.

Agri-Business Camp at Gangtok

Dr. R P Medhi, Director, NRCO welcomes Mr. P T Bhutia, Principal Director. Dept of Agriculture, Govt of Sikkim

Exhibition of different ITMUs of Eastern Zone

ZTM-BPD Unit of NIRJAFT, Kolkata, in association with National Research Centre for Orchids, Pakyong, Sikkim organized one day Agri Business Camp at Chintan Bhavan, Gangtok on June 24, 2013. The objective of the camp was to promote the potential technologies of the sixteen ICAR catchment research institutes in East and North-East India under ZTM-BPD Unit of NIRJAFT, Kolkata. The camp was attended by senior officials from Department of Agriculture, Government of Sikkim, entrepreneurs from North Eastern States, ITMU In-charges of the catchment institutes, scientists, research scholars and technical staffs of NRC for Orchids as well as ICAR Research Complex for NEH region, Gangtok Centre along with ZTMC officials. The inaugural session was chaired by Dr. R. P. Medhi, Director, NRC for Orchids, Pakyong. Mr. P. T. Bhutia, Principal Director, Department of Agriculture, Government of Sikkim was the Chief Guest and Mr. D. K. Bhandari, Joint Director, Horticulture and Cashcrop Division, Government of Sikkim was the Guest of Honour.Dr. A. N. Roy, CPI, ZTM-BPD Unit, NIRJAFT, elucidated the concept of agri-business camp and the purpose of ZTM-BPD unit. A visit to the exhibition

displaying different commercial technologies of catchment institutes, namely, NIRJAFT, NRCO, DWM, NRCP, CRIJAF, CIFA, CIFRI, DRWA was arranged. Mr. Gautum Bhattacharya, entrepreneur and owner of Sabuj Shakti Agrotech, shared his success story and the assistance received from ZTM-BPD unit, NIRJAFT in his business endeavours. He expressed desire to extend his business venture to orchid production. Dr. D. Ram of National Horticulture Board, Gangtok Centre enlightened the gathering about the funding schemes of his organization for promotion and marketing of commercial horticulture. During an interaction session with entrepreneurs Mr. Siddharth Rai, an entrepreneur from Sikkim acknowledged the benefit of Agribusiness Camps and showed interest in 'Pork processing' and 'Mixed orchid farming' technologies. Mr. B. K. Adhikari, Dairy farmer, member of Farmers' Investor Group and Yuva Jagriti Sangha (NGO), said that the Camp was an eye opener, especially the presentation on financial assistance was of great help, as he was planning to extend his business from diary to horticulture.

IPR Awareness Programme

Inaugural session of IPR Awareness Programme

The ITMU of National Research Centre for Orchids, Pakyong organized an one day IPR Awareness Programme jointly with ZTMC, NIRJAFT, on June 25, 2013 in their Institute. The objective of the programme was to sensitize the scientist, Research Associates, SRFs and technical staff of the institute about Intellectual Property related issues. The inaugural session was chaired by Dr. R. P. Medhi, Director, NRC for Orchids, Pakyong. Mr. D. K. Rai, Principal Director, IPM, Spice, Department of Agriculture, Government of Sikkim was the Chief Guest. After the inauguration session, Dr. P. K. Ganguly, In charge, ITMU, NIRJAFT, Kolkata emphasized the crucial role of patent search in research and development. Dr. A. N. Roy, Member Secretary, ZITMC (East Zone), gave a presentation on "ZTMC support on Search, Filing and Maintenance of Patent & Plant Variety Protection & Breeders Rights". Mr. Barun Sarkar, Business Manager gave a presentation on "Technology commercialization and preparation of Bankable Project Report". Proper presentation of monthly RFD Report of ITMU was also discussed.

Institute Technology Management Committee (ITMC) Meeting

The meeting of Institute Technology Management Committee was held on July 11, 2013. The meeting was charied by Dr. D. Nag, Chairman of ITMC and Dicertor, NIRJAFT. In this meeting approval was given for filing of patent for two technologies.

Agri Business Camp at Port Blair

Inaugural Ceremony

Dr D Rama Rao, ND, NAIP and Mr A Prakash, Chief Secretary, Andaman & Nicobar Islands visiting the exhibition

ZTM-BPD Unit of NIRJAFT, Kolkata, in association with CARI, Port Blair, Andaman & Nicobar Islands organized a one day Agribusiness Camp on July 27, 2013 at the Conference Hall of CARI, Port Blair. The objective of the camp was to promote the potential technologies of the sixteen ICAR catchment research institutes in East and North east India under ZTM-BPD Unit. Mr. Anand Prakash, Chief Secretary, Andaman & Nicobar Islands was the Chief Guest and Dr. D. Rama Rao, National Director, NAIP, was the Guest of Honor. Dr. S. Dam Roy, Director, CARI, Dr. A. N. Roy, Member Secretary, ZTM-BPD Unit (East Zone) and ITMU In-Charges were also present. The camp was attended by the bank personnel, innovative farmers and entrepreneurs. An exhibition was organized for exhibiting technologies and products of catchment institutes. Dr. D. Rama Rao shared the success story of recently organized Agri-Tech Meet at New Delhi, where ICAR entered into agreements with different companies valued at around Rs. 5 Crores. The inaugural session is followed by the presentation of NIRJAFT, Kolkata; CIFA, Odhisa; CRIJAF, Barrackpore; IINRG, Ranchi; NRC for Orchids, Pakyong and CARI, Port Blair.

Celebration on Independence Day

NIRJAFT celebrated the country's 67th Independence Day on August 15th, 2013 at the office premises organised by the security staffs. Dr. D. Nag, Director of the institute hoisted the flag in presence of all staff members of the institute. In his speech, he wished all happy Independence Day and reminded the sactifices of freedom fighters for achieving this moment of glory. Cultural programme was organized by staff members on this occasion along with the National song.

Institute Staff Joint Council Meeting

The IJC meeting was held on September 10, 2013 under the Chairmanship of Dr. D. Nag, Director, NIRJAFT. Dr. S.N. Chattopadhyay, Member Secretary, IJC read out the following agenda items and discussed in detail: arrangement for IJC office room, liveries for the staffs, seating arrangement of staffs, operation of externally funded projects, filling up of the vacant posts, PF advance policy, involvement of staff for telephone operation.

Annual workshop of ZITMC (East zone)

Chairman and Member Secretary in workshop

Workshop is in progress

On September 26, 2013, Annual Workshop of Zonal Institute of Technology Management Committee (ZITMC), East zone was held in BPD Hall of NIRJAFT under the Chairmanship of Dr. D. Nag, Director, NIRJAFT. Members of ZITMC (East Zone) and ITMU in charges of the different catchment institutes under ZTMC- East zone participated in the same. The key agenda of discussion was the problems faced by ITMUs regarding patenting, funds, revision of formats of monthly RFD report, need for IPR sensitization workshop for scientists of different institutes, setting up of technology display centre, and commercialization and valuation of patent. Dr. A. N. Roy, Member Secretary, ZTMC – East zone presented 'the Activities of *ZTMC – East zone for the year 2012-2013'*. Dr. Vikram Singh, Scientist, IP & TM division, ICAR, Head Quarters presented *'the mandate of IP & TM Unit of ICAR'*. There was a lecture on "*IP protection of Synthetic gene*" by Dr. M. Padmavati, Member, ZITMC and Associate Professor, Rajiv Gandhi School of Intellectual Property Law, IIT Kharagpur followed by a lecture on '*Need for Knowhow protection , Trademark and Design registration'* by Dr. S. K. Mitra, Member, ZITMC and Assistant Controller of Patent, Indian Patent Office, Kolkata. The ITMUs discussed their problems related to IP with Dr. M. Padmavati and Dr. S. K. Mitra. Decision was taken to organize "IP clinic" at different catchment institute to meet the specific problems on IPR related matters and making prior art search mandatory before research.

Agri-Investor's meet

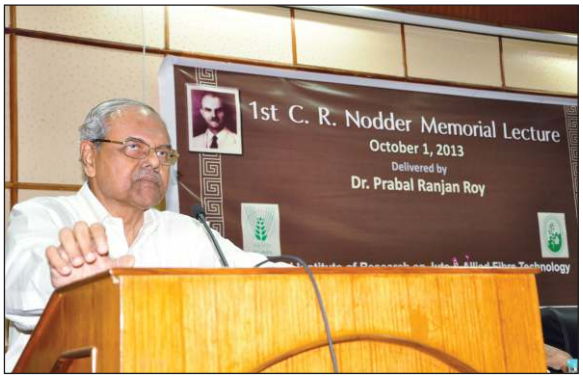
Agri-Investor's Meet on September 27, 2013 was organized by ZTM-BPD Unit of NIRJAFT for Entrepreneurs and Incubatees. Dr. M. M. Pandey, CEO, Agri-innovate India Ltd. ICAR was present as Chief Guest and Dr. P. S. Pandey, National Coordinator, NAIP - I also attended the programme as the Guest of Honour. Five MoA and four MoU were signed out of which seven was from NIRJAFT Technologies. There was an exhibition and also

presentation on commercially viable technologies. In a special session with bank personnel, there was one to one discussion of the problems faced by entrepreneurs while looking for financial assistance for their start ups.

Workshop on Library Automation

An one-day workshop on the theme "Library automation: Impact on dissemination of scholarly output of an R & D organization" was organized by, NIRJAFT on September 28, 2013 in Institute auditorium. Experts in Library & Information Sciences from different Institutes/ organizations delivered lectures. Prof. Amitabha Chatterjee, Ex Head, Library & Information Sciences, Jadavpur University was the chief guest. On the basis of their suggestions and guide line, a road map was prepared for automation of NIRJAFT library.

C. R. Nodder Memorial Lecture



Dr P R Roy addressing the audience

Felicitation to Dr Rama Rao

NIRJAFT celebrated the 1st C.R. Nodder Memorial Lecture on October 1, 2013 to commemorate the works of the first Director (1939-49) of this Institute, Dr. Charles Reynolds Nodder (1894 – 1987). In this occasion, Dr. D. Nag, Director welcomed eminent textile engineer Dr. Prabal Ranjan Roy, former Chief Executive (Textiles), M/S Arvind Mills Ltd and Dr. D. Rama Rao, National Director, NAIP and Acting DDG (Agricultural Engineering). The director in his addresss, highlighted the credit of Dr. Nodder for building up this institute from its infancy and the progress in research and development at his supervision. Dr. Nag also read out the letter from Ms. Julie Millerick, Curator, Dundee Heritage Trust where Dr. Nodder was associated with. In the presidential address, Dr Rama Rao suggested on documentation of history and works of all directors till date and keeping the copy of the same in library. Dr. G. Bose, Head, MP Division, introduced Dr. Prabal Ranjan Roy as eminent scientist and addressed as "Father of Denim in India". In the memorial lecture, Dr Roy emphasized on importance of not only jute but also other ligno-cellulosic fibres in technical textile. He forecasted the leadership of jute and rise in importance of linen in near future. He stressed upon the importance of knowledge of marketing and participation in commercialization of own technologies for the scientist. At the end both the guests were presented by the memento.

Inauguration of Hindi Room

Dr. D. Rama Rao, Acting DDG (Agricultural Engg.), Dr. P. Chandra, Director, CIAE, Bhopal and Dr. D. Nag, Director, NIRJAFT inaugurated a new room for Hindi Section on October 01. 2013.

Institute Research Committee Meeting

XII-4th Institute Research Committee Meeting was held on October 7-8, 2013. The meeting was chaired by Dr. Debasis Nag, Director in presence of Dr. A. K. Roy Choudhury, Professor, GCETTS; Dr. T. K. Guha Roy, Former Dy. Director, IJIRA; Dr. S. Banerjee, Officer-In-Charge, GCETTB; Dr. S. C. Ray, Professor, DJFT, University of Calcutta; Dr. S. Bhattacharyya, Officer-In-Charge, GCETTS; Prof. P. K. Das, Former Professor, BCKV; Dr. B. Maji, Head, CSSRI Regional Station, Canning Town; Shri Ujal Sen, Adviser, NJB; Ms. Chandrani Gupta, Dy. Director, Ministry of Textile; Shri S. Saha, MSME, GoWB; Shri S. K. Haldar, MSME, GoWB and Shri Rajarshi Maji, Asstt. Director (Hosiery), MSME, GoWB. Dr. P. K. Ganguly was acted as Member Secretary.

Pre- Institute Research Committee meeting was held on January 23-25, 2014 under the chairmanship of Dr. Debasis Nag, Director and in presence of experts namely, Dr. S. K. Chakrabarti, Scientist, IJIRA; Prof. D. Chakrabarty, HOD, Deptt. Of Polymer Science & Technology, Rajabazar Science College; Prof. P. K. Das, Former Professor, BCKV; Dr. S. K. Biswas, Former Director, JCI; Dr. P. G. Karmakar, Head, Crop Science, CRIJAF; Dr. S. Bhattacharyya, Officer-in-charge, GCETTS; Dr. S. K. Sett, Prof., DJFT, University of Calcutta; Dr. A. K. Singh, Director, Zonal Project Directorate, Zone-II; Shri D. Ghosh, MSME, GoWB and Dr. B. Mukherjee, Former Dy. Director, IJIRA. In this meeting, 17 ongoing projects, 7 new projects and 3 adhoc projects were discussed. Dr. S. N. Chattopadhyay was acted as Member Secretary.

XII-5th Institute Research Committee Meeting was held on March 22, 2014. The meeting was chaired by Dr. Debasis Nag, Director in presence of Dr. G. Basu, PS & Head, Mechanical Processing Division, Dr. G. Roy, PS & Head, Quality Evaluation and Improvement Division, Dr. A.K. Roy, PS & HoD, Chemical & Bio-Chemical processing Division and Dr. A.N. Roy, PS & Head, Transfer of Technology Division. In this meeting 3 completed projects, 23 ongoing projects and 5 adhoc projects were discussed. Dr. S.N. Chattopadhyay was acted as Member Secretary.

Vigilance Awareness Week

NIRJAFT has observed Vigilance Awareness Week from October 28 to November 2, 2013. The theme of this year is 'Promoting Good Governance: Positive Contribution of Vigilance'. On November 1, 2013 an oath taking ceremony was held in presence of Dr. G. Bose, Director (Officiating) and Vigilance Officer of NIRJAFT. He emphasized all the staffs to be transparent in their work and also expressed that vigilance is not only concerned with financial matter but also with other quality of works. It was concluded that vigilance an important component of transparent and efficient work culture. A lecture on "Administrative Vigilance" was delivered by Dr. D. Nag, Director on March 24, 2014 for generating awareness among the staffs of NIRJAFT to follow the rules of administration during their work.

Task Force Meetings on "User Friendly Jute Grading System"

The 1st meeting of task force on User Friendly Jute Grading System was held on November 16, 2013 at the Institute Committee Room under the chairmanship of Dr. Debasis Nag, Director, NIRJAFT. He emphasized on the necessity of restructuring the existing Jute Grading System. The committee unanimously agreed to modify the existing Jute Grading System and considered 5 grades with 5 physical parameters namely strength, defects, root content/ lower barky content, fineness /bulkdensity, colour/ luster. 2nd meeting of Task Force was held on November 18, 2013, under the chairmanship of Dr. Debasis Nag. After discussion, weight-age of different parameters were decided and accordingly the grading table was accepted. IJMA representatives proposed that jute mills sample should be tested and compared the results between the existing and proposed grading system. After testing the 13 jute samples supplied by IJMA, the 3rd Task Force meeting was held on January 15, 2014. The results were discussed and in some cases the differences between the mills grade and existing grades are prominent. But the tested grade and proposed grade is consistent and ultimately the proposed jute grading system was accepted by the task force committee. They also requested to submit a concise report on proposed grading system to Jute Commissioner for BIS acceptance.

1st Task Force Meeting on "User Friendly Jute Grading System" held on November 16, 2013 at 11.00 in the NIRJAFT Committee Room

The meeting of Task Force on "User friendly jute grading system" was held on November 16, 2013 under the Chairmanship of Dr. Debasis Nag, Director, NIRJAFT at Committee Room. The meeting was attended by the following members, viz. Sri R.K. Roy, Assistant Director (Jute Machinery), Office of the Jute Commissioner, Sri Anindya Majumdar, The Jute Corporation of India Ltd., Prof. Sadhan Chandra Ray, Head, Deptt. of Fibre Science & Technology, Institute of Jute Technology, Dr. D. Sur, Advisor, Indian Jute

Industries Research Association, Kolkata, Sri Nirmal Kr. Bhutoria, Chairman, Jute Balers Association, Dr. S.C. Saha, Asstt. Chief Technical Officer, NIRJAFT. Special Invitees are Prof. P.K. Das, Former Head, Bidhan Chandra Kirishi Viswavidyalaya, Dr. S.K. Biswas, Former Director, Directorate of Jute Development and Dr. G. Roy, Head, QE&I Division, NIRJAFT. Sri Mahadeb Datta, AD (JM) National Jute Board, Sri S.P. Bakshi, Secretary, Indian Jute Mills Association, Dr. P.G. Karmakar, Head, Crop Improvement Division, Central Research Institute for Jute & Allied Fires, Barrackpore, Dr. Ram Prasad Ghosh, Asstt. Director of Agriculture, Govt. of West Bengal, Farook Mohammad, Farmer.

2nd meeting of Task Force was held on November 18, 2013

The meeting of Task Force on "User friendly jute grading system" was held on 18th November 2013 under the Chairmanship of Dr. Debasis Nag, Director, NIRJAFT. Sri D. Mahato, Deputy Jute Commissioner, Sri R.K. Roy, Assistant Director (Jute Machinery), Office of the Jute Commissioner, Sri Anindya Majumdar, The Jute Corporation of India Ltd., Sri S.P. Bakshi, Secretary, Indian Jute Mills Association, Prof. Sadhan Chandra Ray, Head, Deptt. Of Fibre Science & Technology, Institute of Jute Technology, Dr. P.G. Karmakar, Head, Crop Improvement Division, Central Research Institute for Jute & Allied Fires, Barrackpore, Dr. D. Sur, Advisor, Indian Jute Industries Research Association, Kolkata, Dr. S.C. Saha, Asstt. Chief Technical Officer, NIRJAFT, Farook Mohammad, Farmer. Special Invitees are Prof. P.K. Das, Former Head, Bidhan Chandra Kirishi Viswavidyalaya, Dr. S.K. Biswas, Former Director, Directorate of Jute Development and Dr. G. Roy, Principal Scientist & Head, QE&I Division, NIRJAFT, Dr. G. Basu, Principal Scientist & Head, MP Divsion.

3rd meeting of Task Force was held on January 15, 2014

The meeting of Task Force on "User friendly jute grading system" was held on January 15, 2014 under the Chairmanship of Dr. G. Basu, Principal Scientist & Head, MP Division, NIRJAFT, in absence of Dr. D. Nag, Director, NIRJAFT, Sri Anindya Majumdar, The Jute Corporation of India Ltd., Sri S.P. Bakshi, Secretary, Indian Jute Mills Association, Prof. Sadhan Chandra Ray, Head, Deptt. of Fibre Science & Technology, Institute of Jute Technology, Dr. D. Sur, Advisor, Indian Jute Industries Research Association, Kolkata, Sri Nirmal Kr. Bhutoria, Chairman, Jute Balers Association, Dr. S.C. Saha, Asstt. Chief Technical Officer, NIRJAFT. Special Invitees are Prof. P.K. Das, Former Head, Bidhan Chandra Kirishi Viswavidyalaya, Dr. S.K. Biswas, Former Director, Directorate of Jute Development and Dr. G. Roy, Principal Scientist &Head, QE&I Division, NIRJAFT.

Hindi Workshop

A one day Hindi workshop on 'Official Language Implementation and Importance of Hindi Training' was held on November 23, 2013 at NIRJAFT with twenty two participants under the Chairmanship of Mr. R. D. Sharma, Assistant Director (OL) and In-charge, Hindi Section. Mrs. Manju Sirin, Assistant Director (OL), Hindi Teaching Scheme, Department of Official Language, Ministry of Home Affairs, GOI delivered lectures on official language policy of the GOI, Hindi noting and drafting, importance of Hindi training and the different incentives given by GOI for working in Hindi. Before starting the session, Sri Singh enquire the knowledge of the participants as well as described

the chronological events of official language. Practiced the drafting and given example in Hindi, English and Bengali and delivered lecture on Hindi language. The participants eagerly acquired the knowledge. Sri R.D. Sharma Asstt Director (OL) offered the votes of thank at the end of the workshop.

Entrepreneurship Development Programme

EDP on 'Dis-integration, De-fibering of Husk, Segregation & Captive Retting of Coconut Fibre' was organised by NIRJAFT on December 5-6, 2013 at Mahila Katthya Kamgar Audyo Co-operative Society Ltd., Vengurla, Maharashtra under NAIP, component-II, in collaboration with CIRCOT, Mumbai. The main objectives of the programme were to sensitize the participants about coconut value chain technology, to create awareness among entrepreneurs about different avenues for financial support and to motivate the participants for business incubation at ZTM-BPD-CIRCOT. Dr. K. K. Satapathi, Ex-Director, NIRJAFT; Dr. S. K. Chattopadhyay, Acting Director, CIRCOT; Dr. G. Bose, CPI, NAIP-II; Dr. S.K. Dey, Senior Scientist, CIRCOT, Mr. Rajkumar, Deputy Director,IRMRA, Thane, Mumbai; Mr. M. K. Gawde, Chairman, Mahila Katthya Kamgar Audyo Co-operative Society Ltd., Vengurla; Mrs. P. Parab, Secreatary, Mahila Katthya Kamgar Audyo Co-operative Society Ltd., Vengurla and other members were made the programme a grand success by lectures, demonstration and interaction. Around 75 participants were present in the programme. The programme ensured the increase of income of small scale entrepreneurs by utilizing the developed technologies.

Official Language Implementation Committee Meeting

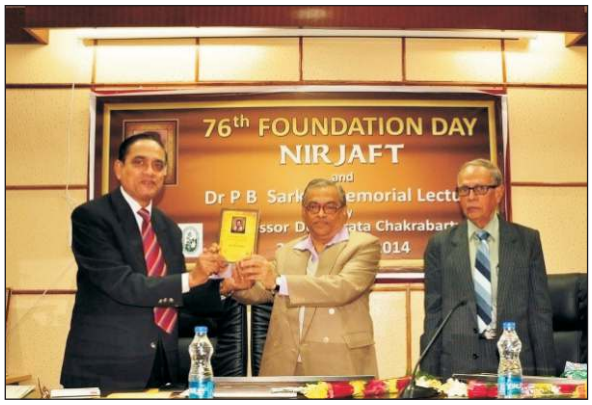
The meeting of Official Language Implementation Committee for the quarter ending December, 2013 was held on December 18, 2013 under the chairmanship of Dr. D. Nag, Director, NIRJAFT. In this meeting, the progress of Hindi in official work was reviewed and discussed the ways to increase the correspondence in Hindi for achieving the required target and to train more people for using Hindi in their daily work. Another meeting of the Official Language Implementation Committee for the quarter ending of March, 2014 was held on March 22, 2014 . In the meeting, bilingual issue of documents was discussed and decided to translate The NIRJAFT News and other documents.

e-GRANTH Workshop

One day workshop on 'Strengthening of Digital Library and Information Management under NARS using KOHA Open Source Software' was organized at NIRJAFT on December 20, 2013 under NAIP, Component-1 in presence of Dr. A. K. Jain, CPI, e-GRANTH, NAIP. Dr. D. Nag, Director congratulated ICAR for including NIRJAFT, Kolkata as a new consortium partner of e-GRANTH project. Dr Jain explained about AGRICAT,

KRISHIKOSH and role of consortium partners in this project. Dr H Chandrasekharan, CPI, CeRA, NAIP described the process by which a scientist can get quicker and latest information of modern research by consulting CeRA website. Dr A. K. Chakraborty, Chief Librarian, Bose Institute, Kolkata presented the scope of library management system automation using open source software KOHA. A short presentation was made regarding progress of e-GRANTH project at NIRJAFT by project team. The workshop was very informative and fruitful to all.

Foundation Day Celebration



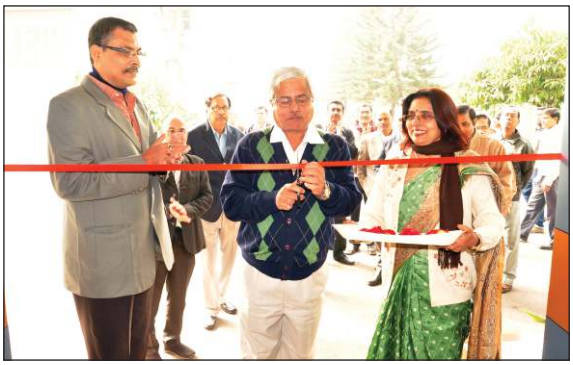
NIRJAFT celebrated the 76th Foundation Day on January 3, 2014. The Foundation Day Lecture was delivered by Dr. B. C. Mitra, Ex-Director and Ex-RAC Chairman, NIRJAFT, Kolkata. In his lecture, he stressed upon research in the field of application of nanotechnology, biotechnology and eco-friendly modification of jute for making it superabsorbent. In the presidential address Dr. D. Nag, Director discussed about the progress of the Institute during last one year. Many ex-employees including Dr. C. R. Debnath, Ex-Director and all the present employees were participated in the occasion.

Dr. P.B. Sarkar Memorial Lecture

NIRJAFT organized the 3rd Dr. P. B. Sarkar Memorial Lecture on January 3, 2014 at the Institute auditorium. On this occasion, the key note address was delivered by Dr. D. Chakraborty, Professor & HOD, Department of Polymer Science & Technology, University of Calcutta. Dr. D. Chakraborty, in his lecture, stressed upon modification of synthetic fibre by manipulation of tension, temperature and time. He described in detail the use of bamboo fibres in different areas of application. He also described the natural fibres as a potential source of nano-cellulose. A book on "Glimpses of Life and Research Work of Dr. P.B. Sarkar" was released in this occasion.

Book Fair

A book fair was organized by NIRJAFT library on January 15, 2014. Famous book suppliers viz., Bharat Book Distributors, Asian Book Pvt. Ltd., Bindings, Trans World Books and S. Chand displayed books of various subjects like textile fibres, textile engineering, basic sciences, mathematics, statistics, basic engineering, environmental sciences etc. The book fair was inaugurated by Dr. G. Bose, Principal Scientist HOD, MP Division and In-charge, Administration. All the



scientists, technical staffs and administrative staffs visited the fair and exercised their choice for procurement of the books for NIRJAFT library.

National Science Day Celebration

The National Science Day was celebrated on February 28, 2014 by demonstration of different technologies, products and processes developed by NIRJAFT to school students. The whole programme was coordinated by Dr. S. Debnath, Senior Scientist. Forty two students of class XI guided by two teachers of the Future Foundation School, Kolkata have taken active participation in this programme. The programme ended with an interactive session headed by Dr. G. Bose, Acting Director. Students were also expressed their ideas.

XXIII[rd] Research Advisory Committee Meeting

XXIII[rd] Research Advisory Committee Meeting was held on March 10-11, 2014 under the Chairmanship of Dr. S. Sreenivasan, Former Director, CIRCOT in the presence of Dr. K. K. Singh, ADG(Engg); Dr. D. Nag, Director, NIRJAFT; Dr. D. Sur, Ex Dy. Director, IJIRA; Dr. S. C. Ray, Prof., DJFT, University of Calcutta; Prof. L. M. Roy, Ex-Prof., IJT; Dr. S. K. Chandra, Ex-Director, Hukumchand Jute Mill, Naihati; Sh. P. Chattopadhyay, Chief Executive, Champdani Industries Ltd., Hooghly; Dr. S. N. Chattopadhyay, Member Secretary and all the scientists & technical officers of NIRJAFT.

Dr. S. Sreenivasan welcomed all the members present in the meeting. After considerable debate, the three major areas i.e. Technical Textiles, Nonwovens and Value addition to other allied natural fibres were identified for carrying out research during the next three to five years. Dr. D. Nag, Director, NIRJAFT made a presentation on the scientific, technical, administrative and supporting staff with regards to the cadre strength

and vacancies. The RAC strongly felt the need for the immediate address to depletion in scientific manpower and suggested to find ways and means to fill up the vacant positions.

In-house Seminar

The following in-house seminars were held in the institute during this period:

Sl. No.	Date	Speakers	Topic
1.	14 June, 2013	Dr. S.K. Dey	Personality development and Team work
2.	21 June, 2013	Smt. Monoleena Banerjee Textile Artist and Designer	INDIGO Once the colour of kings now king of colours
3.	12 July, 2013	Dr. D.K. Adhikari, Chief Scientist & Head, Bio-fuels Division, Indian Institute of Petroleum, Dehradun	Bio-fuels from Bagasse
4.	03 August, 2013	Dr. S.B. Roy	The Technology Transfer Process - Licensing as the Vehicle
5.	13 August, 2013	Dr. L.K. Nayak	Conversion of Jute -stick into biomass Energy – A New approach for agricultural waste management
6.	13 August, 2013	Dr. L. Ammayappan	Development of hygienic jute textiles by a novel method
7.	16 August, 2013	Dr. S.N. Chattopadhyay	Consultancy Pr ojects Management
8.	30 August, 2013	Dr. N.C. Pan	Application of biotechnology in the coloration of jute fabric using bis -triazinyl type of reactive dyes
9.	30 August, 2013	Dr. S.N. Chattopadhyay	Sustainable colouration of jute fabric usi ng natural dyes with improved colour yield and functional properties
10.	31 August, 2013	Shri Chander Mohan, Project Associate, IIT Delhi	Frue Wash: Natural shelf life extender of fruit & vegetable without refrigeration
11.	06 September, 2013	Mr. R. Rajkumar, Deputy Director, IRMRA	Application of Textiles in Rubber Industry: An Overview
12.	13 September, 2013	Mr. Adhiraj Didwania, Indian Angel network	angel investments
13.	21 September, 2013	Dr. R.K. Ghosh	Biomass ash utilization & pesticide false detection
14.	21 S eptember, 2013	Shri Seiko Jose	Study on fire retardancy of jute fabric using nano zinc oxide
15.	12 November, 2013	Dr. Utpal Sen	Sensitization workshop on Management Information System (MIS) & Financial Management System (FMS)
16.	22 January, 2014	Dr. Biplab Saha	Effect of organic farming on carbon footprint and quality of jute fibre.
17.	31 January, 2014	Dr. L. Ammayappan	In-situ deposition of nanosilver on jute fibre and its effect on performance of jute based bio-composites.

Seminar/ Conference/ Workshop/ Meeting Attended

Subject	Venue	Date	Participants
Agri Summit, 2013	ICAR Research Complex for Eastern Region, Patna	April 08 -09, 2013	Dr. B. Saha
National Meet on Technological Innovations in Agriculture	New Delhi organized by NAIP, ICAR, New Delhi.	May 21, 2013	Dr. G. Bose
Platinum Jubilee Seminar, Series 1	Indian Jute Industries Research Association (IJIRA), Kolkata	May 24, 2013	Dr. D. Nag
World Environment Day - 2013 meet	The Institute of Engineers, West Bengal State Centre at Sir RN Mukherjee Hall, Gokhale Road, Kolkata - 700 020	June 05, 2013	Dr. B. Saha
DST projects review workshop	RV College, Mysore Road, Bengaluru - 560059	June 20 -21, 2013.	Dr. S. Debnath
Lecture on Indigo – the king of colours delivered by Monolena Banerjee	NIRJAFT, Kolkata	June, 21, 2013	Scientists & Tech. Staffs
Agribusiness Camp	National Research Centre for Orchid, Sikkim	June 24, 2013	Dr. A.N. Roy
Executive Development Programme (EDP) on Leadership,	NAARM, Hyderabad	June 25 -29, 2013	Dr. D. Nag
Special meeting on occasion of Farmers' day	CRIJAF, Barrackpore	June 27, 2013	Dr. S. Banik
National workshop on "Strategies and strengthening NARS libraries under e -GRANTH" organized by NAIP, ICAR	NRL Auditorium, IARI, New Delhi	July 05 -06, 2013	Dr. S.N. Chattopadhyay
Directors' Conference	NAAS Complex, New Delhi	July 15 -17, 2013	Dr. D. Nag
Platinum Jubilee Seminar, Series 2	Indian Jute Industries Research Association (IJIRA), Kolkata	July 26, 2013	Dr. D. Nag
Agribusiness Camp	CARI, Port Blair on	July 27, 2013	Dr. A.N. Roy
Management Development programme on Consultancy Project Management	NAARM, Hyderabad	August 01 - 07, 2013	Dr S N Chattopadhyay

Subject	Venue	Date	Participants
International Conference on Environment and its Impact on society	J.D. Birla Institute, Kolkata	August 18 - 20, 2013.	Dr. L. K. Nayak, Dr. S. Debnath, Dr. S. N. Chattopadhyay
Awareness Building and Sensitization Workshop on National Fund for Basic Strategic and Frontier Application Research in Agriculture (NFBSFARA)	NIRJAFT, Kolkata.	August 23 - 24, 2013	Dr. D. Nag, Dr. G. Bose Dr. S. N. Chattopadhyay
1st C. R. Nodder Memorial Lecture at on	NIRJAFT, Kolkata	September 01, 2013	Scientists & Tech. Officers
SAS workshop	DWM, Bhubaneswar	September 05 -06, 2013	Shri S. Das
Seminar on Present problems and future prospects of Cold Storage	Sir R.N. Mookerjee hall of Institution of Engineering, Kolkatta	September 06, 2013.	Shri Kulwant Dhiya, Dr. S. Debnath, Dr. S.N. Chattopadhyay, Dr. N.C. Pan
Talk on Application of textiles in rubber industries and overview by Mr K Rajkumar of Indian Rubber Manufacturers Association	NIRJAFT, Kolkata	September 06, 2013	Scientists & Tech. Officers
Angel Investment by Shri Adhiraj Didwania of M/s Indian Angel Network	NIRJAFT, Kolkata	September 13, 2013	Scientists & Tech. Officers
International Seminar on Geo-textile	National Jute Board (NJB), Kolkata	September 19, 2013	Dr. D. Nag
Brain storming workshop on Grading	NIRJAFT, Kolkata	September 20, 2013	Dr. D. Nag
Annual workshop on Zonal institute of technology management committee(ZITMC) east zone	NIRJAFT, Kolkata	September 26, 2013	Scientists & Tech. Officers
Agri - Investors' meet	NIRJAFT, Kolkata	September 27, 2013	Scientists & Tech. Officers
Implementation of Eco-labelling /Eco-compliance in Jute Sector	IIJIRA, Kolkata at Williamson Magor Hall	September 27, 2013	Dr. B. Saha
Attended One - Day Seminar - cum -Buyer Seller Meet on Jute Based Green Textile Products and its Environmental Impact	Sir R.N. Mookerjee Hall, West Bengal State Centre, The Institution of Engineers (India).	September 28, 2013	Dr. L.K Nayak, Dr. S. Debnath, De. S.N. Chattopadhyay, Dr. S. Sengupta

Subject	Venue	Date	Participants
International Conference on , Advances in fibres, finishes, technical textiles and non -wovens organized by American Association of Textile Chemists and Colourist (AATCC), USA	Mumbai	October 01 - 02, 2013	Dr N C Pan, DrS N Chattopadhyay
Consultation workshop	Bali Island, Sunderban, South 24 Parganas	October 02,2013	Dr. D. Nag
11 th International Technical Conference on Pulp, paper, conversion and allied industries under the theme Global pulp and paper industry: problems and prospects organized by IAPARMA, New Delhi	Pragati Maidan, New Delhi	October 24 - 26, 2013	Dr S N Chattopadhyay
Seminar on Jute Testing Instruments – IJIRA Developments	IJIRA, Kolkata	October 25, 2013	Dr. S. Sengupta
Seminar on Emerging technology trends in scientific research organized by M/s AMETEK	National Test House, Kolkata	October 25, 2013	Dr A KRoy, Dr N C Pan
International Conference on Challenges and Possibilities for Up -Scaling High Value Products from Himalayas with Focus on Himalayan Nettle	India Habitat Center (IHT), New Delhi	October 30, 2013	Dr. S. Debnath
Mid-term review workshop of RFD, 2013 -14.	IASRI, New Delhi.	November 06, 2013	Dr. A.N. Roy
CIC and CAC meeting of NAIP Component 3 project	Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar	November 12 -13, 2013	Dr. S. Debnath
India International Trade Fair 2013	Pragati Maidan, New Delhi	November 14 to 27, 2013	Dr. A.N. Roy, Dr. L.K. Nayak
9 th Review Workshop, CAC & CIC meeting of NAIP, Component -II	NIRJAFT, Kolkata	November 15, 2013	Dr A K Roy, Dr N C Pan, Dr S N Chattopadhyay

Subject	Venue	Date	Participants
Task force meeting on grading	NIRJAFT, Kolkata	November 16, 2013	Dr. D. Nag
4th AGRO PROTECH 2013	Milan Mela Grounds, Kolkata.	November 28 -30, 2013	Dr. A.N. Roy
NAIP Component II Review work	ISI, Kolkata	December3 , 2013	Dr. D. Nag
3rd International Exhibition and Conference on Agri - Machinery & Equipment	PUSA Campus, IARI, New Delhi	December 06 -07, 2013.	Dr. L.K Nayak
First Curricullum Development Committee Meeting	Department of Physics, NIT Rourkela	December 10, 2013	Dr. B. Saha
Agribusiness Camp	NRC on Yak, Dirang, Arunachal Pradesh	December 17, 2013	Dr. A.N. Roy
Talk delivered on Biofuel from bagasse, By Dr D K Adhikary, Chief Scientist and Head, Biofuels Division, Indian Institute of Petroleum, Dehradun, Uttrakhand.	NIRJAFT, Kolkata	December 17, 2013	Scientists & Tech. Officers
Workshop on Automation of Library Management System using Koha Open Source Software	NIRJAFT, Kolkata	December 20, 2013	Scientists & Tech. Officers
Workshop cum training on Integrated and digital library management system organized by Library and Informatics Section, CIFRI, Barrackpore.	CIFRI, Barrackpore	December 21, 2013	Dr. S. N. Chattopadhyay Dr. (Mrs) R. Naiya
Agribusiness Camp	ICAR Res. Complex for NEH Region, Barapani, Meghalaya	December 21, 2013	Dr. A.N. Roy
2nd National Conference on Emerging Trends in Textile, Fibre and Apparel Engineering -2013	Government College of Engineering and Textile Technology, Baharampore, West Bengal.	December 21 -22, 2013	Dr. G. Bose
Seminar on Electronics Jute Testing Instrument	IJIRA, Kolkatta	December 25, 2013.	Shri Kulwant Dhiya
26th Industrial India Trade Fair	Milan Mela Ground, Kolkata.	December 27, 2013 – January 05, 2014	Dr. A.N. Roy

Subject	Venue	Date	Participants
76 th Foundation Day of NIRJAFT & 3d Dr P B Sarkar Memorial Lecture delivered by Dr D Chakraborty, Professor of Polymer Science & Technology, University of Calcutta.	NIRJAFT, Kolkata	January 03, 2014	Scientists & Tech. Officers
Directors and Vice-Chancellors Meet	Pune, Maharashtra	January 18-20, 2014	Dr. D. Nag.
14 th Professor N. Majumdar Memorial Oration	Sir R.N. Mookerjee Hall of the Institution of Engineers (India).	January 22, 2014	Dr. L. K. Nayak
Mid-Term Review workshop of regional committee -II	Barrackpore, Kolkata	January 24,2014	Dr. D. Nag
Management Development Workshop on Technology Management for Researchers	National Academy of Agricultural Research Management (NAARM), Hyderabad	January 27-31, 2014	Dr. S. Debnath
National Seminar on Relevance of Organic Farming in Indian Agriculture	National Institute of Advanced Studies, Bangalore	February 03-04, 2014	Dr. B. Saha
Conference on Natural dyes (Colours of nature), organized by NGO, SUTRA, Kolkata	Indian Council of Cultural Relation, Kolkata	February 15 – 16, 2014	Dr S N Chattopadhyay
Training on "KOHA professional software" under NAIP, e-GRANTH organized by Library and Informatics Section, CIFRI, Barrackpore.	CIFRI, Barrackpore	February 17 – 19, 2014	Dr S N Chattopadhyay Dr. (Mrs) R. Naiya
National seminar on agricultural produce Export	Kolkata	February 21, 2014	Dr. D. Nag
Review workshop of Zonal NBSFARA Project	NIRJAFT, Kolkata	February 22, 2014	Dr. D. Nag

Subject	Venue	Date	Participants
2nd National Seminar on Standards in Technical Textiles: Role of Standardization in Health, Safety and Environment by BIS, Ministry of Textiles and FICCI.	Mayfair Hotel, Worli Mumbai,	February 25, 2014	Dr. G. Bose
Workshop of IPv6 organized by IASRI.	NASCcomplex, New Delhi.	February 27, 2014	Shri S. Das
11th All India Network Project on Jute & Allied Fibres	Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal	March 01- 02, 2014	Dr. D.P. Ray
All Indian Network Project (AIMP) Workshop	UBKV, Coochbehar	March 1, 2014	Dr. D. Nag
National Seminar on Food Security and Sustainable Agriculture	RKMVU at Narendrapur, West Bengal	March 02, 2014	Dr. B. Saha, Dr. G. Bose
Final workshop ZTM -BPD	NASC complex, Pusa, New Delhi	March 07 - 08, 2014.	Dr. A.N. Roy
Meeting for implementation of NFSM - Commercial crop Jute during 2014 -15.	Directorate of Jute Development, Govt. of India	March 14, 2014	Dr. S. Banik
Workshop on Research Project Proposal Development, organized by NFBSFARA, ICAR, New Delhi	NAARM, Hyderabad	March 24 - 26, 2014	Dr. G. Bose
2nd Advisory Committee Meeting of Funded Project, NFBSFARA	NIRJAFT, Kolkata.	March 25, 2014	Dr. S. Debnath
Agri-Investors' meet	NIRJAFT, Kolkata	March 26, 2014	Scientists & Tech. Officers
Second Curriculum Development Committee Meeting	Department of Physics of NIT, Rourkela	March 28, 2014	Dr. B. Saha
Technological Conference on Recent Developments in Textiles.	Kennedy Hall, Department of Jute & Fibre Technology, University of Calcutta	March 29, 2014	Dr. D.P. Ray Dr. S.N. Chattopadhyay Dr. N.C. Pan
Seminar on linking farmers to market - challenges and prospects" organized by FICCI.	Hotel Taj Bengal, Kolkata	March 31, 2014	Dr. S. Banik

Training/ Workshop Organised

- Training on Value addition in jute & allied fibres through post harvest processing Sponsored by Directorate of Jute Development under MM-II of Jute Technology Mission, from April 16-20, 2013.
- National level training programme on "Value addition to jute seed: a new approach' in the area of "Value addition in jute & allied fibres through Post Harvest processing" Sponsored by Directorate of Jute Development Board, Ministry of Agriculture, Govt. of India from April 16-20, 2013.
- Awareness Building and Sensitization workshop of NFBSFARA, ICAR for Eastern India of National Fund for Basic, Strategic and Frontier Application Research in Agriculture (NFBSFARA) sponsored by Indian Council of Agricultural Research, New Delhi during August 23-24, 2013.
- Panel discussion on User friendly jute grading system on September 20, 2013.
- Annual workshop of ZTMC on September 26, 2013.
- Agri Investors' Meet on September 27, 2013.
- Training on Jute Handicrafts from December 02-07, 2013.
- Training-cum-workshop programme on coconut and jute-coconut blended handspun yarn under project NAIP-II & NAIP Component III conducted in Shankartala village, Malda district from December 18-27, 2013 by NIRJAFT, Kolkata.
- Workshop on "Strengthening of Digital Library and Information Management under NARS (e-Granth) using KOHA Software" on December 20, 2013.
- A book fair was organised by NIRJAFT Library on January 15, 2014.
- Self sponsored training programme on Jute Ornaments was organised from January 20-25, 2014.
- Self sponsored training programme on "Jute Bags" from February 10-22, 2014.
- Praveen Training was organized from February 11 to March 10, 2014.
- Review workshop of NFBSFARA funded projects of eastern region at NIRJAFT, Kolkata on February 22, 2014.
- Pragya training was organized from March 11 to April 02, 2014.
- Second advisory committee meeting of NFBSFARA funded project on March 25, 2014.
- Agri Investors' Meet on March 26, 2014.
- Entrepreneurship development program on Disintegration, defibring of husk, segregation and captive retting of coconut fibre, December 5-6, 2013 in Mahila Katthya Kamgar Audyo Co-operative Society Ltd. Vengurla, Maharastra.

Publication

Paper Published

- Ammayappan L., Nayak L.K., Ray D.P. and Chakraborty S., Nanotechnology intervention on wool fibre for value addition, *Asian Dyer*, Vol. 11, No.1, 2014, 29-33.
- Ammayappan L., and Chakraborty S., Natural Colourants and their applications – An overview, *Man Made Textiles in India*, Vol. 56, No. 12, 2013, 427-430.
- Ammayappan L., Nayak L.K., Ray D.P., Das S. and Roy A.K. Functional finishing of jute textiles-an overview in India, *Journal of Natural Fibres*, Vol. 10, No. 4, 2013, 390-413.
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- Debnath Sanjoy and Madhusoothanan M., Studies on Compression Behaviour of Polypropylene Needle Punched Nonwoven Fabrics under wet condition, *Fibres and Polymers*, Vol. 14, No. 5, 2014, 854-859.
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- Nag, D., *Present Cold Storage Scenario in West Bengal*, Published in the Proceedings of the National Seminar on "Present Problems and Future Prospects of Cold Storage in West Bengal" organized by Agricultural Engineering Division, West Bengal State Centre, The Institution of Engineers (India), Sept. 06, 2013.
- Nag, D.*Business incubation: Role on market mobilization of jute and allied fibre products*,National Level training sponsored by Directorate of Jute Development, Ministry of Agriculture, Govt. of India. organized by NIRJAFT, Kolkata, 2013.

Lecture Delivered

The lectures were delivered by

Dr. D. Nag

- *Improving Research in Agricultural Extension: Issues and Way Forward*, in Brain storming session organized by Zonal Project Directorate (ZPD)-II, Kolkata, April 26, 2014.
- *Role of R&D institutes and commercialization of technologies for entrepreneurs* organized by WEBCON, Kolkata, August 29, 2013.
- *Post-harvest technology for handling of export quality Agri/horti. produces*, in "Sensitization Programme on Agri Exports in West Bengal: Opportunities and Challenges" organized by Agricultural Produce Export Development Authority (APEDA), Min. of Commerce and Industries, Govt. of India, Feb. 21, 2014.
- *English language in Technical Education* during 1st International Conference on Transcending Boundaries: English Language in Technical Education, (ELITE 2014) organized by Global Institute of Management and Technology, Krishnanagar, Nadia, West Bengal, February 14, 2014.

Dr. G. Bose

- *Standardization of Agrotextiles for better Agricultural; Productivity* – 2nd National Seminar on Standards in Technical Textiles: Role of Standardization in Health, Safety and Environment held at Mayfair Hotel, Worli Mumbai, organized by BIS, Ministry of Textiles and FICCI, February 25, 2014.

Dr. L.K. Nayak

- *Extraction and utilization of banana fibre* in the National Level training Sponsored by Directorate of Jute Development, Kolkata and Organized by NIRJAFT, Kolkata during April 16-20, 2013.
- *Non-conventional Energy from jute biomass* in the National Level training Sponsored by Directorate of Jute Development, Kolkata and Organized by NIRJAFT, Kolkata during April 16-20, 2013.
- *Extraction and utilization of Date-palm and Palmyra-palm fibres* in the National Level training Sponsored by Directorate of Jute Development, Kolkata and Organized by NIRJAFT, Kolkata during April 16-20, 2013.

Dr. S. Banik

- *Different methods of retting of jute* to State Government Officers in district level training programme at Chinsura, Hooghly, February, 2014.
- *Retting technology of jute*to State Government Officers in refresher training course on under MM-II of JTM 2013-14 at Howrah in February 2014.
- *Process of dry retting for extraction of good quality jute fibre,* State Government district level officers at Narendrapur RamKrishna Mission Ashram, Narendrapur under mini-Mission II of Jute Technology in November, 2013.
- *Dry retting for remuneration to farmers*, during National level Training Programme on "Value addition in Jute and Allied Fibres through post-harvest processing" at NIRJAFT, Kolkata during April, 2013.

Dr. S. Debnath

- *Development of Warm Fabrics from Jute-Based Material*" at National Level Training on "Value Addition in Jute & Allied Fibres Through Post Harvest Processing", Sponsored by Directorate of Jute Development, Kolkata, Under Mini Mission-II of Jute Technology Mission, April 16-20, 2013.
- *Different component of handlooms and there importance for development of towel in handloom*, at Shankartala Village, Malda on August 01, 2013.
- Weaving of jute-cotton doormat and its marketing at Pulintala Village, Malda on September 29, 2013.
- Marketing of jute-cotton doormat at Malda, and Making of coconut & jute-coconut blended yarn by hand spinning technique and its Market potentia under NAIP III and NAIP II at Shankartala, Malda on December 28, 2013.
- *Diversified uses of jute & Allied Fibres* organised by Ramakrishna Mission Samaj Sevak Shikshan Mandir, Belur Math, Howrah on February 11, 2014.

Dr. N.C. Pan

- *Application of biotechnology in the coloration of jute fabric* organized by The Textile Association (India), West Bengal Unit, November, 16, 2013.
- *Treatment on Natural Fibre* at The Development Commissioner Handicraft, GoI Regional Design and Technical Development Centre, Kolkata, February 21, 2014.

Dr. S. N. Chattopadhyay

- *Application of biotechnology in the coloration of jute fabric* organized by The Textile Association (India), West Bengal Unit, November, 16, 2013.

Dr. L Ammayappan

- *Role of Chemical modifications of natural fibers for improvement in functionality*at National workshop on "Tropical drifts in Chemistry" held Nadar Saraswathi College of Arts & Science, Theni, Tamilnadu, September 6, 2013.

Dr. S. Sengupta

- *Agro-textiles from jute and allied fibres: Recent developments* in National Level Training Programme on "Value addition in jute and allied fibres through post-harvest processing" at NIRJAFT, Kolkata on April 16-20, 2013.

Dr. V.B. Sambhu

- *Mechanization in fibre extraction from jute and mesta plants in* National Level Training programme on "Value addition in Jute and Allied Fibres through Post Harvest Processing Organized by NIRJAFT, Kolkata during April 16-20, 2013.
- *Extraction of bast natural fibres and its utilization on* during the training cum visit programme of a group of 20 farmers from Himachal Pradesh at NIRJAFT, Kolkata, March*2, 2014*.

Dr. D.P. Ray

- *Botanical pesticides for agricultural pest control*at National Workshop on Botanical Identification & Evaluation of Indian Medicinal Plants, School of Natural Products, Jadavpur University, Kolkata.

Research Support Service

Library

NIRJAFT library has a holding of about 18,300 books. It is a member of CeRa (Consortium e-resources in agriculture). It contains 2000+ e-journals in agricultural sciences. Library section renders reference services, photocopy services, current awareness services and abstracting services to fulfil the user's requirements. Library keeps contact with reputed Institutes and Libraries for exchange of articles and information through internet. Library section interacts with different Institutes and organization by mailing annual reports, newsletters, misc. reports and Institute's publications in a regular frequency and receives the same from different Institutes. Valuable old, rare and damaged books are present in the library. Partial digitization of those library books has been completed for preservation and which act as e-book. Visitors from different Institutes/organizations enjoy facilities of reading, consulting *CeRA* (consortium e-resource in agriculture) and photocopy services. NIRJAFT was selected as one of the partner of a NAIP project under component -I entitled "Strengthening of digital library and information management under NARS (e-GRANTH) under component -I of National Agricultural Innovation Project (NAIP), Cooperating Centre – NIRJAFT, Kolkata" for digitization of library management system. One server and two computers were procured and installed. KOHA library management software was installed on DEBIAN. Bibliographic information of all our library books were entered in KOHA and the entries of bound volume are in progress. Prepared circulation rule and membership cards of all the staffs of NIRJAFT for circulation of all the library documents using KOHA library management software. Designed OPAC screen for NIRJAFT and circulation of library documents has been started using KOHA library management system. Now NIRJAFT library management system is totally digitized.

e-Granth workshop

NIRJAFT, Kolkata organized one day workshop on "Strengthening of Digital Library and Information Management under NARS (e-GRANTH) using KOHA open source software" under NAIP, Component-1 at NIRJAFT Auditorium on December 20, 2013. All scientists, senior level technical officers, senior level administrative and financial personnel, all library staffs and library representatives from nearby ICAR institutes participated in the workshops. Dr Debasis Nag, Director NIRJAFT welcomed all the delegates. Dr. Sambhu Nath Chattopadhyay, Principal Scientist, NIRJAFT and CCPI of e-GRANTH project narrated the importance of organizing this workshop before the audience. Swami Chitrupananda, Librarian, Ramakrishna Mission Institute of Culture, Golpark, Kolkata spoke about the importance of digitization of library management system and important role of library for improving the quality of research work of scientists. In the technical session, Dr. A. K. Jain discussed about the advantages of KOHA open source software for digitization of library management system and its scope. Dr. H. Chandrasekharan, CPI, CeRA, NAIP, Component-I described in detail how a scientist can get quicker and latest information of modern research output i.e., publication by consulting CeRA website. Dr. Arun Kumar Chakraborty, Chief Librarian, Bose Institute, Kolkata presented the scope of library management system automation using open source software KOHA. A short presentation was made regarding progress of e-GRANTH project at NIRJAFT by project team. The workshop was very informative and fruitful to all. Dr. (Mrs.) Rina Naiya, In-Charge Library, NIRJAFT & Co-PI, e-GRANTH proposed a vote of thanks to the dignitaries and participants.

e-Granth training

A training programme was arranged for on-line use of NIRJAFT library on March 28, 2014. All staffs of NIRJAFT attended the training and learnt how to use Koha OPAC from their own computers.

PME Cell

PME cell acts as a nodal centre for administration, coordination, monitoring and evaluation of R&D activities of the institute. Under the close supervision of Director, PME cell participates in various research planning and resource allocation mechanism, inviting peer reviews from experts and keeping documents of institute's projects, human resource developments in frontier areas of research and decentralization of management functions and powers. Direction of research in obtained from SFC documents, QRT recommendations and RAC meetings which are in unison with institute mandate. PME cell organizes all these meetings and finally progress of the projects are critically evaluated by holding IRC meetings under the chairmanship of Director, NIRJAFT. Institutional seminars are regularly organized by PME cell where scientists and technologists present their research papers for obtaining approvals from competent authorities for subsequent presentation in national or international events after critical evaluation. Eminent scientists are also invited to talk in the current and prospective frontier areas of research. All the information received by the institute regarding career advancements, capacity development and R&D activities from ICAR and other national or international organization are percolated to the scientists, technical officers or other staff of the institute through PME cell. All the necessary steps are taken to nominate scientists and other staff of the institute for different events around the globe. PME cell delivers the R&D reports as well as replies to numerous queries sought by the ICAR HQ and Parliament as and when required. Apart from that, publication of institute Annual Report and other documents are prime activity of the PME Cell.

DDM Section

The onus of infrastructure development works of the Institute is borne by the Design, Development & Maintenance Section which provides crucial support services for R&D work in different Divisions and laboratories of the Institute. This section provides monitors and maintains all forms of Civil, Electrical, Mechanical works, Sanitation, Plumbing Institute vehicle movement and support services like garden and watch and ward and Fire Fighting. Planning, coordinating & execution of major infrastructure development works of the Institute, preparation of Master Plan of the institute through external agencies is also coordinated by this section. Some of the infrastructure works undertaken and completed are renovation of the Canteen building, new room for Medical Officer, Cashier, Indian Natural Society, Recreation Club, Security Staff room and IJC room. These were renovated, completed and handed over. Fibre Extraction Unit Shed was completed as pert of post harvest Technology Park. The Institute main gate no.-1 was completely renovated and re built.

R&D work with regard to the development of NIRJAFT power ribboner, jute decorticator, gassifier, briquetting machine is also undertaken by this section in collaboration with QE&I and TOT Division as an intra Institutional research effort for development & refinement of post harvest technology. This section is solely responssible for fabrication and assembly of different jute grading instruments like Fibre Strength Tester, Air Flow Fineness Tester, Colour & Lustre Metre & Bulk Density Metre, which were developed by the Institute, and are fabricated in the DDM Section. These instruments are fabricated and supplied on order basis to different national & international organizations. The Farmers Hostel is also maintained and monitored by this section.

This section has also recently developed a Coconut Fibre Strength Tester in collaboration with NAIP, Component-II.

Quality Assurance Section

Quality Assurance Section is working under Quality Evaluation & Improvement Division. Basically this section deals with fibre properties and grading of jute & mesta fibre and doing regular physical tests as a part of many research projects initiated in NIRJAFT, CRIJAF and other organizations including All India Network Project (AINP). The institute is having very good infrastructure for short training programme on jute grading. Theoretical and practical training on grading methods are provided on demand basis. This training course is conducted to acquaint marketing personnel and other people from different organizations and agencies with the BIS specifications on raw jute grading. The section is doing quality evaluation of fibres from different breeding, agronomical and quality trials on jute, mesta, sunnhemp, flax and ramie fibre under All India Network Project (AINP) headed by CRIJAF. These trials were conducted for commercial recommendation with a view to selecting varieties which produced fibres of good quality and high yield.

Different jute grading instruments like Fibre Bundle Strength Tester, Air-flow Fineness tester, Colour & Lustre Meter and Bulk Density Meter which were developed by the institute are calibrated by the section for supplying these instruments to the different organizations and jute mills as per order received.

The section has also taken up adhoc research project on Development of Ramie fibre grading system to find out the easy grading system and process. The system of testing of jute, mesta samples received from outside agencies on payment basis has been done regularly. A good number of outside parties have been availing of the testing facilities of this section.

Hindi Cell

Meeting

The meetings of Official Language Implementation Committee for four quarters during 2013-14 was held on 22.06.2013, 12.08.2013, 18.12.2013 and 22.03.2013 respectively under the chairmanship of Dr. D. Nag, Director, NIRJAFT. Steps to increase the correspondence in Hindi, bilangual issue of documents, Praveen and Pragya traininig were mainly discussed in those meetings.

Hindi Workshop

Four Hindi Workshops were arranged on Official Language Implementation, Hindi Noting and Drafting; different forms of letter; Importance of Hindi and official language policy of the Govt. of India and Hindi noting & drafting were held on 18.05.2013; 17.08.2013; 23.11.2013 and 01.03.2014 respectively. These four Hindi Workshops were graced by Dr. Rustam Rai, Additional Director (Official Language), Department of Official Language, Ministry of Home Affairs, GoI, Sri Ram Narayan Saroj, Deputy Director (OL), Hindi Teaching scheme, Deparment of Official Language, Ministry of Home Affairs, Government of India, Smt Manju Sireen, Asstt. Director, Hindi Teaching scheme, Deparment of Official Language, Ministry of Home Affairs, Government of India.

Hindi Fortnight Celebration

Hindi Fortnight Celebration was observed in the institute during September 13-30, 2013. During this period an extempore competition was organized on September 13, 2013, a Debate competition was organized on September 16, 2013 and a Recitation Competition was organized on September 20, 2013 among the staff members of the institute. Hindi Fortnight closing celebration was organized on September 30, 2013 under the chairmanship of Dr. D. Nag, Director, NIRJAFT. Dr. Indu Joshi, Lecturer of Seth Anandram Jaipuria College and Guest Lecturer of Calcutta University graced the occasion as Chief Guest. The programme was started with the Lamp Lighting. Dr. Joshi in her key speech suggested to work more and more in Hindi. She also said that there are many developed countries doing their official work in their own language. The time has came to do our official work in our language. Dr. D. Nag in his presidential address expressed that to perfom the works in bilingual form viz Hindi-English is not only the duty of Hindi Cell but also it is a constitutional responsibility of each employee that they should render their official works originally in Hindi to the maximum extend.

Distinguished Visitors



- Ms. Desiree Rasenberg, Director, M/S Pure Jute, Netherlands.
- Tushar Maharaj from Ramkrishna Mission Ashram, Sargachi, Murshidabad, West Bengal.
- Mr. Johan Peston Jamas, Director, Strategic Development
- Mr. Avnish Pandya, Director, Research & Development, BOHECO.
- Shwami Shivapurvananda of Ramkrishna Vivekanada University
- Dr. Nasim Ali of Ramkrishna Vivekanada University
- Dr. Maganala Rai, Advisor to the Chief Minister of Bihar and Former Secretary, DARE & DG, ICAR, New Delhi.
- Dr. D. Rama Rao, Acting DDG (Engg.), ICAR, New Delhi
- Mr. Ariho Alex, Facility Coordinator, UniBRAIN, Forum for Agricultural Research in Africa (FARA), Ghana, Africa.
- Mr. S.M. Karuppanchetty, CEO, Agri Innovation Platform, ABI, ICRISAT
- Dr. N. P. Singh, Director, ICAR Research Complex, Goa
- A group of farmers from the Jute & Mesta growing areas of Andhra Pradesh.



Research & Development Programme 2013-2014

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
	Quality Evaluation & Improvement Division			
QEI-4	Standardization of fungal retting by dry fermentation procedure for water economy.	Dr. S. Banik	April, 2010	September, 2013
QEI-7	Development of a user -friendly jute grading system.	Dr. S.C. Saha	October, 2010	September, 2013
QEI-8	Development of technology for extraction and characterization of useful phytochemicals from jute (*Corchorus* sp.) and dhaincha (*Sesbania* sp.) seeds.	Dr. D. P. Ray	April, 2011	March, 2014
QEI-10	Online moisture measurement system for lignocellulosic fibre processing system.	Dr. G. Roy	September, 2011	August, 2013
QEI-11	Environmental impact analysis of jute and jute products in view of carbon balance.	Dr. B. Saha	October, 2010	September, 2013
QEI-12	Development of an extractor to produce good quality banana fibre for textile use.	Dr. L. K. Nayak	April, 2012	March, 2014
QEI-13	Design and development of a commercial extractor for PALF.	Dr. D. Nag	October, 2012	March, 2014
QEI-14	Development of suitable expert system for analysis of defects of jute fabrics during inspection.	Shri S. Das	May, 2012	March, 2015
QEI-15	Development, Application And Techno-Economic Analysis Of Crop Specific Agrotextiles.	Dr. B. Saha	October, 2013	September, 2016
QEI-16	Development Of Electronic Colour And Lustre Meter For Jute and Mesta Fibre.	Dr. G. Roy	October, 2013	September, 2015

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
Mechanical Processing Division				
MP-2	Enhancing the figuring capacity of developed hand loom and study of its weaving performance for speciality fabric production and product development therefrom.	Dr. A. N. Roy	April, 2010	March, 2014
MP-3	Processing of natural fibres like banana and linseed in jute spinning system and development of value added products.	Dr. A. N. Roy	April, 2010	March, 2014
MP-7	Study on bending, frictional and electrical behaviour of jute materials.	Dr. S. Sengupta	April, 2010	March, 2014
MP-8	Process Technology For Value Added Diversified Products From Blends Of Pineapple/Silk/Ramie.	Dr. S. K. Dey	April, 2013	March, 2016
Chemical & Biochemical Processing Division				
CBP-7	Application of enzymes for making pulp and paper with improved characteristics using different lignocellulosic fibre.	Dr. S. N. Chattopadhyay	October, 2012	September, 2015
CBP-8	Development of bioadhesives for the use of agricultural residues (cassava stalk, coconut stem) in preparation of particle board.	Dr. N. C. Pan	October, 2012	September, 2014
CBP-9	Functional finishing of jute textile by suitable nanoparticles.	Dr. L. Ammayappan	October, 2012	September, 2015
Transfer of Technology Division				
TOT-7	Studies On Techno -Economic Constraints And Opportunity Of Jute Diversified Products Manufacturing.	Dr. S. B. Roy	October, 2012	March, 2014
All India Network Project				
AINP-1.01	Quality evaluatin of Jute and allied fibres under various agricultural trials.	Dr. S.C. Saha	Continuous Process	

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
		Sponsored Project/Contract Research		
NJB/MM-IV/6.2	Development of electronic and microprocessor based integ rated instrumentation for jute grading system.	Dr. G. Roy	April, 2011	Till Complition
DST-1-IDP/IND/2010/19	Design & development of computerized instrument for testing bending behaviour of semi-rigid fabrics with special reference to technical textiles.	Dr. S. Sengupta	April, 2012	March, 2015
DST-2-IDP/IND/2010/25	Development of an efficient staple yarn characterization unit with multi sensor fusion and field programmable gate array (FPGA) based data reduction card.	Dr. A. Sengupta BESUS, Howrah, Dr. S. Sengupta, NIRJAFT, ICAR	November, 2011	October, 2014
NFBSFARA-FQ-3029	Jute based biocomposites for industry.	Dr. P. K. Ganguly	July, 2012	June, 2015
NFBSFARA-FQ-3030	Understanding genetics and biosynthesis of gum in ramie (*Boehmeria nivea* L. Gaud.) for develop ing low -gum genotypes.	Dr. Pratik Satya CRIJAF, ICAR, Dr. D.P. Roy, NIRJAFT, ICAR	June, 2012	May, 2016
JTM MM III	Evaluation and Demonstration of high capacity power ribboner for extraction of ribbon from jute and mesta plants.	Dr. V.B. Shambhu	July 2012	September 2013
		NAIP Project		
NAIP, Component-I	Zonal technology management and business planning and development (BPD) unit at NIRJAFT, Kolkata.	Dr. D. Nag	June, 2009	March, 2014
NAIP, Component-I	Strengthening of digital library and information management under NARS (e -GRANTH)	Dr. S.N. Chattopadhyay	June, 2013	March, 2014
NAIP, Component-	A value chain on coconut fibre and its byproducts: Manufacture	Dr. G. Bose	November, 2008	December, 2013

Personnel

As on 31-03-2014

Dr. Debasis Nag	M. Tech. Ph.D., FIE(I)	Director
QEI Division		
Dr. Gautam Roy	MEE, Ph.D.	Principal Scientist & Head of Division
Dr. S. Banik	M.Sc.(Agri.), Ph.D.	Principal Scientist
Dr. Biplab Saha	M.Sc., Ph.D	Principal Scientist
Dr. Deb Prasad Roy	M.Sc., Ph.D	Senior Scientist
Sh. Kulwant Dhiya	M.Tech.	Scientist
Dr. Subhas Chandra Saha	M.Sc.Ph.D.	Assistant Chief Technical Officer
Smt. Rina Nandi	B. Sc. (Hons.); B. A.	Senior Technical Officer retired on 31/01/2014
Sh. Nemai Paik	SF, ITI	Technical Officer retired on 31/01/2014
Sh. Subhendu Bikash Mondal	B. Sc.; B. Ed.	Senior Technical Officer retired on 28/02/2014
Sh. Arindom Ghosh	B.Sc.	Senior Technical Officer
Sh. T.K. Ghosh	B.Sc.	Technical Officer
C&BP Division		
Dr. Ashim Kumar Roy	M.Sc.,Ph.D.	Principal Scientist & Head of Division
Dr. P. K. Ganguly	M. Tech., Ph. D	Principal Scientist & I/C PME Cell retired on 31/12/3013
Dr. S.N. Chattopadhyay	M.Tech.,Ph.D., FIE(I), FTA	Principal Scientist & I/C PME Cell w.e.f. 01/01/2014
Dr. N.C. Pan	M.Tech.,Ph.D., FIE(I), FTA	Principal Scientist
Dr. L. Ammayappan	M.Sc., Ph.D	Senior Scientist
Dr. Rakesh Kr. Ghosh	Msc., Ph.D	Scientist
Sh. K. Patra	H.S. Dip. In Elec. Engg.	Technical Officer
Sh. Amalesh Khan	B.Sc.	Technical Officer
Sh. PradipTalukdar	S.F.	Technical Officer
Sh. Basudev Chakraborty	H.S. ITI	Technical Officer
MP Division		
Dr. Gautam Basu,	M.Tech., Ph.D.(Tech.), FIE(I), PFDJT	Principal Scientist & Head of Division & I/C Admin
Dr. Surajit Sengupta	M.Tech., Ph.D.(Tech.), C. Engg., FIE(I), PGDFM	Principal Scientist
Dr. Sanjoy Debnath	M.Tech.,Ph.D., FIE(I)	Senior Scientist
Sh. Seiko Jose	M.Sc.	Scientist
Dr. S. K. Dey	M. Tech., Ph. D.	Assistant Chief Technical Officer upto 31/07/2013
Sh. Prakash Singh	Mechanical Engg.	Technical Officer upto 18/05/2013
Sh. Kamal Kr. Banerjee,	Madhyamic	Technical Officer
ToT Division		
Dr. Alok Nath Roy	M.Tech., Ph.D	Principal Scientist & Head of Division
Dr. Samir Baran Roy	M.Sc., Ph.D.	Senior Scientist & I/C ITMU
Dr. Laxmikanta Nayak	M.Tech.,Ph.D.	Senior Scientist

Dr.Vidya Bhushan Sambhu	M.Tech.Ph.D.	Senior Scientist
Sh. Sujai Das	M.Sc. (Computer Sc.)	Scientist (Senior Scale)
Sh. Koushik Mitra	B.A	Technical Officer
Smt. Riva Ghosh	H. S. & Diploma in Computer Application	T. O. (Telephone Operator) retired on 31/12/2013

DDM Section

Dr. Gautam Bose,	M.Tech.Ph.D.(Tech.), FIE(I)	Principal Scientist & HoD & I/c, DDM Section
Sh. Prosanjit Sanyal	B.Sc. (Agriculture Engg.)	Assistant Chief Technical Officer
Sh. L. M. Patra	H.S.,Dip. In Elec.Engg	Assistant Chief Technical Officer
Sh. Prabin Chowdhury	S.F.ITI	Technical Officer
Sh. Chanchal Kundu,	H.S., Dip	Technical Officer
Sh. Kartick Chandra Majumder	ITI	Technical Officer
Sh. Laltu Mondal	Class VIII	Technical Officer (Driver) retired on 31/12/2013

PME Cell

Dr. P. K. Ganguly	M. Tech., Ph. D	Principal Scientist & I/C PME Cell retired on 31/12/3013
Dr. S. N. Chattopadhyay	M.Tech.,Ph.D., FIE(I), FTA	Principal Scientist & I/C PME w.e.f. 01/01/2014
Dr. Surajit Sengupta	M.Tech.,Ph.D., FIE(I)	Principal Scientist & Member PME Cell
Dr. Utpal Sen,	M.Sc., Ph.D	Assistant Chief Technical Officer
Smt. P. R. Ghatak	B. Sc.	Assistant Chief Technical Officer upto 20/07/2013
Mr. Himadri Sengupta	Diploma	Sr. Technical Officer
Dr. Debabrata Das	M.Sc.(Ag), Ph.D.	Technical Officer

Hindi Cell

Sh. Ram Dayal Sharma,	MA (Hindi), DHT, PGDT	Additional Director (OL), I/C, Hindi Cell
Sh. K.L. Ahirwar	M.A.	Senior Technical Officer

Library Section

Dr. (Smt). Rina Naiya,	B.Sc., B.Lib, Ph.D.	Senior Technical Officer& I/C Library
Sh. Srikumar Chowdhuri,	HS	Technical Officer

Administration

Sh. Rajeev Lal	B.Sc. (Physics Honours)	Chief Administrative Officer
Sh. B. Kabi	B.Com	Drawing and Disbursing Officer
Mrs. Anasua Majumder	MSc.	Asstt. Finance &Accounts Officer
Smt. Lipika Ghosh	P. U.	Asstt. Administrative Officer (Adm-II) retired on 31/01/2014
Shri Swapan Chakraborty	B. Com.	Asstt. Administrative Officer (Stores) retired on 28/02/2014
Sh. P. K. Purkayastha	P.U.	Asstt. Administrative Officer (Adm-I)
Shri Swapan Kumar Batabyal	B. Com.	Asstt. Administrative Officer (F & A Section) retired on 28/02/2014
Sh. Swapan Kumar Sinha,	B.Com	Asstt. Administrative Officer (Stores)
Sh. Kamalesh Chandra Bose,	SF	Asstt. Administrative Officer (Adm-II)
Sh. Balaram Chatterjee	B.Com	PS to Director

Financial

A. The budget provision and actual utilization under Plan, Non Plan, NAIP, (Funded by World Bank) & Plan Schemes during 2013-14.

(Amount in Lakhs)

Sl. No.	Name of Heads	Opening Balance	Fund Received	Actual Utilization	Closing Balance
1.	Non-Plan	6.39	1423.02	1337.53	85.49
2.	Plan	0.87	196.50	184.09	12.41
3.	NAIP Projects	0.75	100.85	106.67	(-) 8.46
4.	Plan Schemes (ITMU & ZTMC)	4.11	20.20	20.55	3.76

A. Sub-head wise budget provision and actual utilization under Institute Plan and Non Plan Schemes during 2013-14.

(Amount in Lakhs)

Sl. No.	Sub - Head	Plan		Non Plan	
		Budget Provision	Actual Utilization	Budget Provision	Actual Utilization
A)	**Revenue Expendture**				
1.	Establishment Expenses	-	-	924.21	891.10
2.	Pension & Other Retirement Benefits	-	-	368.61	326.23
3.	Travelling Allowances	6.50	6.50	8.00	7.97
4.	Research & Operational Expenses	24.0	23.99	9.22	9.20
5.	Administrative Expenses	65.30	65.20	117.07	116.71
6.	Miscellaneous Expenses	26.70	26.49	12.50	12.34
	Total of A	**122.50**	**122.18**	**1439.61**	**1363.54**
B)	**Capital Expenditure**				
1.	Equipment	43.50	43.46	4.00	3.99
2.	Works	-	-	-	-
3.	Library Books & Journals	0.20	0.17	-	-
4.	Vehicles	-	-	-	-
5.	Furniture & Fixture	-	-	-	-
6.	Information Technology	8.30	8.28	-	-
	Total of B	**52.00**	**51.91**	**4.00**	**3.99**
7.	**TSP**	**10.00**	**10.00**	**-**	**-**
	Total (A+B)	**184.50**	**184.09**	**1443.61**	**1367.53**

Balance Sheet as on 31st March, 2014

Corpus/Capital Fund and Liabilities

(Amount in Rupees)

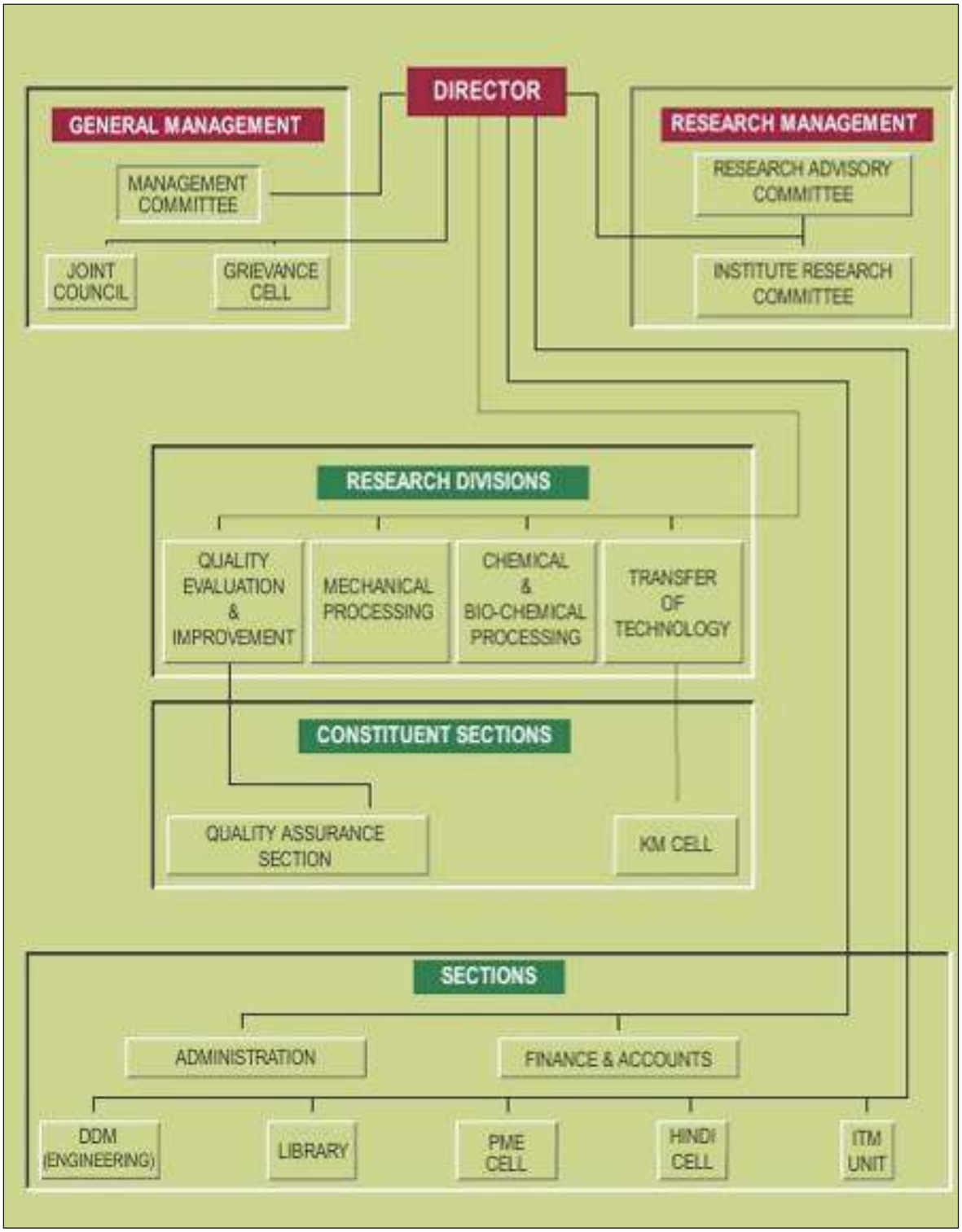
Sr. No.	Sub Head	Schedule	Current Year	Previous Year
1.	Capital Fund	1	179034291	181653826
2.	Reserves	2	16564192	16064244
3.	Earmarked/Endowment Fund	3	3036551	3301483
4.	Current Liabilities & Provisions	4	19676447	14107259
Total (1 to 4)			218311481	215126812
Assets				
5.	Fixed Assets	5	193462458	185709026
6.	Investments – Earmarked Endowment Funds	6	0	0
7.	Current Assets, Loans & Advances	7	24849023	29417786
Total (5 to 7)			218311481	215126812
8.	Significant AccountingPolicies	22	0	0
9.	Contingent liabilities & Notes to Account	23	0	0

Income & Expenditure Account for the Year Ended 31st March, 2014

(Amount in Rupees)

Head	Schedule	Current Year	Previous Year
A. Income			
Income from Sales/ Service	8	1631947	1535174
Grants in aid/ subsidies	9	156769043	155206387
Fees/ Subscriptions	10	0	0
Income from Investments	11	0	0
Income from Royalty, Publications	12	0	0
Interest Earned	13	674235	970528
Other Income	14	1504908	1754995
Prior Period Income	15	0	0
Total (A)		**160580133**	**159467084**
B. Expenditure			
Establishment Expenses	16	121596783	114111135
Research & Operational Expenses	17	8819111	10533101
Administrative Expenses	18	26912216	18497076
Grants and Subsidies	19	0	0
Miscellaneous Expenses	20	4715752	6030531
Depreciation	5	8251126	8588385
Prior Period Expenditure	21	0	0
Total (B)		**170294988**	**157760228**
Balance being surplus/ (Deficit) carried to corpus Capital Fund		**-9714855**	**1706856**

Institute Organogram



NATIONAL INSTITUTE OF RESEARCH ON JUTE & ALLIED FIBRE TECHNOLOGY
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
12, Regent Park, Kolkata - 700 040
West Bengal, India
Dial + 91 33 2471-1807 (Director), + 91 33 2421-2115/6/7(EPBX)
Fax 91-33-2471 2583
email nirjaft@vsnl.net, director@nirjaft.res.in
website www.nirjaft.res.in