Platinum Jubilee Year

1939-2014

ANNUAL REPORT 2012-13

NATIONAL INSTITUTE OF RESEARCH ON
JUTE & ALLIED FIBRE TECHNOLOGY
Indian council of Agricultural research

ICAR

ANNUAL REPORT

2012 - 2013

NATIONAL INSTITUTE OF RESEARCH ON JUTE AND ALLIED FIBRE TECHNOLOGY
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

Editorial Team
Dr. P. K. Ganguly
Dr. U. Sen, Ms. P. R. Ghatak & Dr. D. Das

Cover Design & Photography
Shri K. Mitra

Design & Printed by
Caps Micrographics
8/2, Kiran Shankar Roy Road, Kolkata-700 001

Contents


ICAR
nirjaft

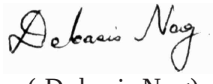
Foreword

Year 2012-13 is an eventful year in the history of this institute as 75 years have rolled by since Technology Research Laboratory has grown from a fledgling institute to a unique and pioneering institution like National Institute of Research on Jute and Allied Fibre Technology in the world for jute and allied fibre research. A skeletal staff consisting of only four technical experts was recruited in May, 1938 which was able to make a good beginning with the preliminary work of research on jute fibre in a room allotted to them by Superintendent of the National Test House in Calcutta. On the 3rd of January, 1939, the Technological Research Laboratories were officially opened by H.E. Lord Linlithgow, the Viceroy in presence of H.E. Governor of Bengal in its present premises and Mr. C. R. Nodder, M.A. (Cantab) joined as First Director of the institute amidst distinguished guests and an audience of about 500 persons who represented all sections of the jute industry. With passage of time, the institute has undergone a thorough reorientation in its activities conforming to changed consumer demand and global scenario.

In commemoration of its Platinum Jubilee, The Indian Natural Fibre Society (TINFS), a new born society formed by the scientists and technical officers of the institute, organized a National seminar in collaboration with NIRJAFT, Kolkata, CRIJAF, Barrackpore, West Bengal and National Jute Board, Min. of Textiles, Govt. of India, Kolkata on 3rd to 5th January, 2013. The event was inaugurated by Dr. S. Ayyappan, Hon'ble Director General, ICAR and Secretary, DARE, Govt. of India in the afternoon of 3rd January, 2013. Earlier on the same day, the institute observed its Foundation Day like previous years with much pomp and show in the presence of Dr. M. M. Pandey, DDG (Engg.) and Dr. R.P. Kachru, Former ADG (Process Engg.), ICAR. Hon'ble DG also inaugurated the Business Incubation Centre established by Zonal Technology Management - Business Planning and Development (ZTM-BPD) Unit of East Zone located at this institute on Sept. 25, 2012

The technological research and development in different areas of jute and allied fibres carried out at NIRJAFT during its 75 years of glorious existence has made remarkable achievements for socioeconomic uplift and created a vast knowledge base for benefit of the stake holders. It is heartening to notice that NIRJAFT has transformed itself from a mere quality testing organization to a research and development institute with distinct activities and also to a storehouse of potential technologies for commercialization. It is playing a path breaking role in the field of post harvest technology on jute and allied fibres while overcoming numerous challenges for more than 7 decades of its existence. The technologies developed by the institute have been adopted by the farmers and industries and applauded by the policy makers for its contribution to the society. The institute has been responsive, vibrant and sensitive to the needs of its stakeholders and is expanding its reach for generating and disseminating new knowledge in the development of technology on natural fibres. In this Platinum Jubilee Year the Institute records with pride and honour the glorious achievements and valued contributions made by the past and present employees. It will be a travesty of justice if we do not remember and respect the departed souls who dedicated themselves for the service of the institute during their lifetime. The institute salutes them with full honours.

I am thankful to Dr. P. K. Ganguly, Dr. Utpal Sen, Mrs. P. R. Ghatak and Dr. Debabrata Das who have prepared this document within a short notice.



(Debasis Nag)
Director

Summary

Increasing awareness about negative impact of petroleum based synthetic products on environment and their non-sustainability in the long run have resulted in emergence of opportunity for jute and allied fibres to diversify into areas of industrial applications where value additions are higher. R & D focus of NIRJAFT has been designed to harness the emerging opportunities in a holistic manner such that whole spectrum of fibre extraction to product development is covered.

The R & D activities of the institute during the period being reported upon comprised of (i) Standardization of fungal retting by dry fermentation procedure for water economy, (ii) Development of a PLC based process control system for jute industry, (iii) Development of a user-friendly jute grading system, (iv) Development of technology for extraction and characterization of useful phytochemicals from jute (Corchorus sp.) and Dhaincha (Sesbania sp.) seeds, (v) Online moisture measurement technique for lignocellulosic fibre processing system, (vi)Development of natural fibre-based geotextiles and placement system for protection of river-bank and improvement of soil stabilization, (vii) Enhancing the figuring capacity of developed handloom and study of its weaving performance for speciality fabric production and product development there from, (viii) Modification of jute spinning machinery, (ix) Study on bending, frictional and electrical behaviour of jute materials, (x) A comparative study of different pulping methods of jute and allied fibres for making value added handmade paper, (xi) Dyeing of jute fabric using natural dyes with improved fastness properties, (xii) Application of biotechnology in the colouration of jute fabric, (xiii) Energy from jute and agro-residue biomass, (xiv)Application of enzymes for making pulp and paper with improved characteristics using different lignocellulosic fibres, (xv) Development of bioadhesives for the use of agricultural residues (cassava stalk, coconut stem) in preparation of particle board, (xvi) Functional finishing of jute textile by suitable nanoparticles, (xvii) Analysis of Information dissemination techniques in transfer of jute and allied fiber technology through training, exhibitions and demonstration for rural development, (xviii) Environmental impact analysis of jute and jute products in view of carbon balance, (xix) Development of an extractor to produce good quality banana fibre for textile use, (xx) Design and development of a commercial extractor for PALF, (xxi) Studies on techno-economic constraints and opportunity of jute diversified products manufacturing, (xxii)Development of suitable expert system for analysis of defects in jute fabrics during inspection, (xxiii) Development of low cost dense jute non-woven fabric, (xxiv) Development of electronic and microprocessor based integrated instrumentation for jute grading system, (xxv) Evaluation and demonstration

of NIRJAFT high capacity power ribboner for extraction of ribbons from jute and mesta plants(xxvi) Design & development of computerized instrument for testing bending behaviour of semi-rigid fabrics with special reference to technical textiles, (xxvii) Development of an efficient staple yarn characterization unit with multi sensor fusion and field programmable gate array (FPGA) based data reduction card, (xxviii) Jute based biocomposites for industry, (xxix) Understanding genetics and biosynthesis of gum in ramie (Boehmeria nivea L. Gaud.) for developing low-gum genotypes, (xxx) Zonal technology management and business planning and development (BPD) unit at NIRJAFT, Kolkata, (xxi) A value chain on coconut fibre and its byproducts: manufacture of diversified products of higher value and better marketability to enhance the economic returns of farmers, (xxxii) Sustainable rural livelihood empowerment project for northern disadvantaged districts of West Bengal.

Design, development and maintenance section fabricated three grading instruments e.g. one-fibre bundle strength tester and two airflow fineness testers. These instruments were supplied to different organizations.

The institute transferred the technology of producing knitted fabrics from jute cotton core sheath yarn developed at NIRJAFT to M/S Saroda Textiles, G.T. Road, Baidyabati, Hooghly, West Bengal.

NIRJAFT organized 24 in house seminars by its scientists which were mainly based on projects they were executing.

The institute organized eight training programme on diversified jute products and production of particle board from agro-residues during the period under review.

It also participated in eight exhibitions with a focus on promoting jute as an eco-friendly and sustainable alternative to plastics/synthetic packaging materials.

NIRJAFT entered the 75th year of its existence in 2013 and on this occasion staff of NIRJAFT organized a National seminar on "Jute and Allied Fibres in Changing Times: Issues and Strategies" in collaboration with The Indian Natural Fibre Society, CRIJAF (ICAR) and National Jute Board during 3rd to 5th January, 2013. Dr. S. Ayyappan, Director General, ICAR inaugurated the seminar in the afternoon of 3rd January, 2013 in the presence of Dr. Subrata Gupta, IAS, Jute Commissioner, Dr. P. Raghaba Reddy, Ex. V.C., ANGARU, AP, Dr. M.M. Pandey, DDG (Engineering) ICAR, Dr. S. K. Datta, DDG (Crop Science) ICAR, Dr. K.K. Satapathy, Director, NIRJAFT, Dr. B. S. Mahapatra , Director, CRIJAF and Mrs. A. Kanwar, IAS, Deputy Jute Commissioner and Secretary, Jute Board. The seminar was a grand success. Three invited papers

were presented by Dr. B.S. Mahapatra, Director, CRIJAF; Sri. D.C. Baheti, E. D. Glaster Ltd. and Dr. D. Sur, Ex-Senior Deputy Director (IJIRA). In the seminar, which had two parallel run sessions, about 72 papers on fibre production and 55 papers on technology were presented. The presentations were followed by a joint plenary session which was very lively and interesting.

On 31st March, NIRJAFT witnessed a change at the helm of the institute with the superannuation of Dr. K. K. Satapathy after very ably guiding the institute for about four years and during which everything about NIRJAFT went through significant improvement.

The Institute

The institute was established in 1938 as Jute Technological Research Laboratories under the auspices of the Indian Central Jute Committee and was shifted to the present campus in 1939. Later on in 1965 it was integrated to the Indian Council of Agricultural Research as a constituent unit. During the long period of seven decades the institute had flourished with multifarious disciplines and carved a niche as a centre of excellence for research on jute and allied fibre technology catering to the farm community and the industry.

The institute is located on the southern fringe of the metropolis of Kolkata known as Tollygunge with a total plot area measuring around 17,628.67 sq. m. which includes the laboratory campus of 13,671.67 sq. m. and the staff quarter, training hostel, scientists' home and guest house campus measuring around 3957 sq. m. The institute is adequately equipped with the state of the art laboratories having sophisticated instruments, equipments, machinery, workshop, library, museum, ARIS cell, pilot plant, generator house etc.

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

Quality Evaluation & Improvement Division deals with fibre quality improvement through basic and technological research on extraction of jute and allied fibres, study of their physico-chemical properties, modifications for diversified end-uses, exploring useful chemicals from fibre plants and enrichment of NIRJAFT culture bank.

Mechanical Processing Division mainly carries out basic and applied research on production of textiles based on jute and allied fibres for traditional and diversified applications including development of efficient machines and instruments.

Chemical & Bio-Chemical Processing Division researches for utilization of agricultural resources of jute and allied fibres for conservation of energy and preparation of value added products such as pulp and paper, composites and particle board and fabrics through bleaching, dyeing and finishing processes.

Transfer of Technology Division looks after transfer of institute technology and entrepreneurship development, Information Technology, Human Resource Development.

The sections render specialized services to the institute viz. **quality assurance** section provides facilities for physical testing of fibres & yarns; **grading section** undertakes the services for grading of jute and training on raw jute grading; **design, development & maintenance section (DDM)** is equipped with the workshop facility for mechanical design, development and fabrication of instruments, equipments and small machinery; **knowledge management cell** provides agricultural research information services and infrastructural support for computer system; **priority setting, monitoring & evaluation cell (PME Cell)** keeps and maintains records and information relating to R&D projects & various reports and interact

with all the divisions for overall coordination in implementing the institute R&D programme.

The **institute technology management unit (ITMU)** deals with I P management and technology transfer/ commercialization for the institute in accordance with the guideline for I P Management in ICAR system.

The **library** of the institute acts as a centre of repository for scientific and technological information on jute & allied fibres by maintaining a wide collection of reference books, periodicals, journals, monographs, reports, reviews etc. relevant to jute and other scientific topics.

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 center 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 31.03.2013

Category	Sanctioned posts	Posts filled	Posts vacant
R.M.P.	01	01	0
Scientific	44	18	26
Technical	60	51	09
Administrative	35	29	06
Supporting	41	32	09
Auxiliary	04	04	0
Total	**185**	**135**	**50**

A Glance at Nirjaft

New Product/Process developed

- It was possible to develop warp-knitted fabric from covered (cotton) jute yarn which is much softer and flexible than all-jute yarn. The fabric has been highly appreciated by the fashion designers and media for its aesthetic appeal at a Fashion Show at Kolkata.

- Light weight disposable carry bag of 5 kg capacity, has been successfully developed from jute nonwoven cloth.
- Jute-based open-mesh (leno-weave or derivatives of leno-weave) fabrics have been developed. For this, a handloom has been modified suitably. The cloth may be used for production of disposable light weight carry-bags for perishable and for agro-textile applications.
- Processing technology for the manufacture of banana and linseed fibre based yarn and decorative fabric
- Process of extraction of natural dyes and their application on bleached jute fabric to produce different shades.
- A fully electronically automated drawing-cum-attenuation machine has been developed for processing of all jute and jute-coconut blended fibres.
- A fungal retting of jute by dry fermentation process has been standardized for water economy.

➥ **Publication :** The institute published fourteen scientific papers in different journals.

➥ **Programme Organised**

- In-house seminar - Twenty four numbers
- A twenty one days summer school was organized in the institute on "Processing, value addition and waste utilization of jute and other allied fibers" sponsored by Indian Council of Agricultural Research, New Delhi from 26 June to 16 July, 2012. Thirteen scientists have participated in the programme.
- A National Seminar was organized at NIRJAFT in the occasion of its Platinum Jubilee Celebration from 3-5 January 2013
- Organised Agri-Business Camps at Directorate of Water Management Research, Bhubaneswar, Odisha on May 2, 2012, at Chamber House of Federation of Jharkhand Chamber of Commerce and Industries, Ranchi on Dec. 14, 2012, at National Research Centre on Pig, Guwahati, Assam on Feb. 14, 2013 and BNCCI House of Bengal National Chamber of Commerce and Industries, Kolkata on March 18, 2013. These camps were jointly organized by Zonal Technology Management-Business Planning and Development (ZTM-BPD) unit of NIRJAFT and Agri-Business Incubation (ABI) Program of ICRISAT, Hyderabad

- Organized Awareness Workshop on "Carbon Foot Print for JDP SMEs - A Step towards Ecofriendliness"on June 23, 2012 sponsored by an NGO, MARGDARSHAK.
- Organized Entrepreneurs Meet on Sept. 25, 2013 which was inaugurated by Dr. M. M. Pandey, DDG (Engg.) with Dr. Bangali Baboo, Former National Director, NAIP, Dr. S. Maurya, ADG (IP&TM), ICAR and Dr. B.S. Mahapatra, Director, CRIJAF, Barrackpore, West Bengal as Guests of Honour.

- Arranged Inauguration of Business Incubation Centre of ZTM-BPD Unit of NIRJAFT, Kolkata by Dr. S. Ayyappan, Hon'ble Director General, ICAR and Secretary, DARE, Govt. of India on Sept. 26, 2012

- Organised Awareness Programme on ISO 9001-2008 by Chief Consultant, AQL Systems and Consultants on March 20, 2013 as the Management Representative among Scientists, Technical Officers, Research Associates, Sr. Research Fellows of the institute

➥ **Training/Demonstration/Transfer of Technology/Human Resource Development**

- Training on 'Weaving using traditional handloom' to 15 farmer women of Sripur Village, Itahar of Uttar Dinajpur district, West Bengal under NAIP Component-III project on 29.09.2012.

- Training on 'Extraction & value addition of banana fibre' to 15 progressive farmers of Dakhin Dinajpur district of West Bengal under NAIP Component-III project at Dakhin Dinajpur Krishi Bigyan Kendra, Maghian, Patiram, West Bengal on 03.12.2012.
- Training on 'Value addition on jute fibres using creative handicraft' to 16 farmer women of Shankartala, Bhimtala, Kalitala and Pulintala villages of Malda district, West Bengal during the programme on "Model Making from Fine Jute" under NAIP Component-III project at Shankartala Project Office, Malda, West Bengal on 11.12.2012 and 15 farmer women of Lalupur Village, Harua Gram Panchiyet, of Murshidabad district, West Bengal on 07.02.2013.
- A six day training programme on SAS software was organised for Scientist and technical staff members of NIRJAFT and CRIJAF, during 25 February to 2 March 2013.

- Under the Project entitled "Training through established institutions" sponsored by Development Commissioner (Handicrafts), Min. of Textiles, Govt. of India, about 100 entrepreneurs were trained under both short term (1 month) and Long term (3 months) programmes on jute handicrafts, soft luggage, slippers and garments.

- One special training programme of one month duration (Jan. 10-Feb. 09, 2013) entitled "Self employment training programme on jute handicrafts" was conducted for 20 entrepreneurs under the sponsorship of Oil and Natural Gas Corporation Limited (ONGC), under its SC and ST Component Plan to promote development of village artisans and craftsmen in order to enhance their earning capacity.

- A model training course of one week duration (Nov. 15-22, 2012) on "Production of particle board from agro-residues" was conducted for 20 entrepreneurs working with State Departments /Agencies sponsored by Directorate of Extension, Min. of Agriculture, Govt. of India.
- A 3days training programme during 11-13 February, 2013 was organized for 20 scientists and technical officers of the institute on "Operation and maintenance of Weather Fastness Tester" procured under NAIP-1 sub-project on ZTM-BPD Unit at NIRJAFT, Kolkata
- The institute demonstrated its technologies among the unemployed youth, entrepreneurs, artisans etc. through :

Participation in exhibitions, trade fairs etc. arranged by the following organizations like

(i) National Convention - The Next Frontier of Agri-Business and Technology, Gandhinagar, Gujrat, Sept. 3-6, 2012

(ii) 2nd. India Crop Summit, 2012, Netaji Indoor Stadium, Kolkata, Sept. 17-18, 2012

(iii) Entrepreneurship Meet, Zonal Technology Management - Business Planning and Development Unit, NIRJAFT, Kolkata, Sept. 25-26, 2012

(iv) 32nd. India International Trade Fair (IITF), Pragati Maidan, New Delhi, Nov. 14-27, 2012

(v) 100th. Indian science Congress, Salt Lake Stadium, Kolkata, Jan. 3-7, 2013

(vi) XIth. Agricultural Science Congress, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, Feb. 7-9, 2013

(vii) Kisan Mela, Rajendra Stadium, Katihar, Bihar, March 17-18, 2013

- **Resource Generation /Consultancy**

1. Revenue of Rs. 50,000/- generated towards rental charges of Business Incubation Centre of ZTM-BPD unit
2. Consultancy charges of Rs. 20,000/- received from ABI, ICRISAT, Hyderabad
3. Institutional Charges of Rs. 10,000/- towards Training programmes sponsored by DC(Handicrafts), Min. of Textiles, Govt. of India
4. Institutional Charges of Rs. 15,000/- towards Training programme sponsored by Oil and Natural Gas Corporation (ONGC)

- **MOU signed: Two**

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

  Grading instruments: Three Nos.

  a) Bundle Strength Tester- 2 nos. • b) Air-flow Fineness Tester- 1 no.

➥ **Instruments Procured**

1. Xenotest 150 S+
   Light Fastness Tester – (In CBP Division)
2. Tinius Oleson
   UTS for Textile Structures – (In MP Division)

➥ **Infrastructural Development**

a) A well-equipped Meeting Room with wireless presentation system

b) A new Committee Room with a seating capacity of about 25-30 adjacent to the Directors' Room.

RESEARCH ACCOMPLISHMENTS

Quality Evaluation and Improvement Division

Achievements

- An online moisture measurement system has been developed for the processing of lignocellulosic fibres
- An Electronic and microprocessor based integrated instrumentation for jute grading system has been developed. Minor modifications is in progress
- A fungal retting of jute by dry fermentation process has been standardized for water economy.
- A solvent based extraction process of waste jute seed oil has been standardized and the oil has been found to effective conditioning agent for processing of jute.
- For easy assessing of the quality and grading of jute an user friendly jute grading system has been proposed

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

Dr S Banik & Ms R Nandi

A breakthrough technology has been developed under this project. Fungal dry retting have been successfully conducted using four pectinolytic fungi with practically no or very little use of water at retting stage and also at the washing stage. Those fungi found to work in aerobic condition and produce alkaline reaction in retting beds. They produce very important pectinolytic enzyme pectin lyase in addition to exo-poly galacturonase and able to conduct retting of jute in almost dry condition. Dry retting is faster than normal water retting and the extracted fibre quality is reasonably good. Method have been developed to extract jute fibre by dry fermentation using pectinolytic fungus without use of water. There is no obnoxious gas production. So the retting system remains environmental pollution free. Retting of jute was conducted with different age plants starting from 90 to 130 days. Fibre strength and fineness indicates their fibre quality to be good. 8 lbs yarn was produced from the fungal retted jute and their quality parameters were evaluated which indicate that the fibres are suitable for making diversified jute products. One project has been submitted in Fibre Platform of ICAR on retting of different natural plant fibres with main theme of dry retting for jute. Extensive field demonstration will be given in next jute season. The experimental results are as follows:

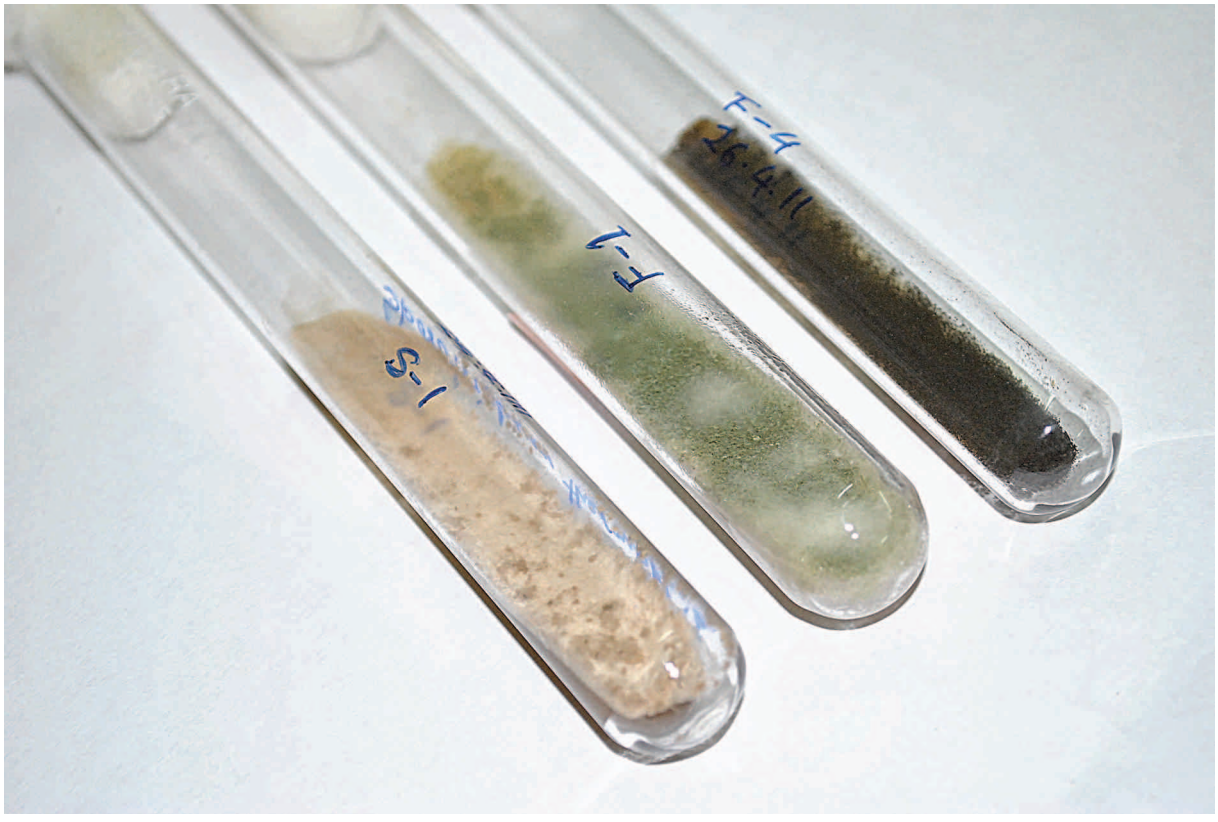


Fig. 1: The fungal cultures in test tubes

Fig 2: Fungal growth on jute plant during fungal retting

Table 1: Enzyme profile of the isolated fungi

Code number of fungus	Exo-Pectniase U/l	Pectin lyase U/l	Xylanase U/l	Cellulase U/l
F-1	22.1	3.8	24.7	27.0
F-2	50.8	8.5	27.2	25.5
F-4	40.7	10.0	26.8	27.0
S-1	57.6	15.8	28.5	23.8

Table 2 : pH of the culture and retted jute plant due to fungal inoculation

Code number of fungus	pH in culture broth	pH in retted jute plants
F-1	8.34	9.16
F-2	7.86	8.74
F-4	7.77	8.90
S-1	8.25	9.20

Table 3 : Screening of fungus by preliminary inoculation trial

Code number of the fungus	Identified as	Fibre strength	Fibre fineness	Fibre grade
F-1	–	17.0	3.0	TD-6
F-2	–	15.9	3.2	TD-6
F-4	–	18.9	3.1	TD-6
S-1	-	18.2	2.6	TD-5
C	Uninoculated control	18.4	3.3	TD-7

Table 4 : Evaluation of fibre quality from 90 days jute plant due to fungal dry retting

Code number of fungus	Root content (%)	Fibre strength (gtex-1)	Fibre Fineness (tex)	Fibre grade
F-1	5	22.7	2.1	TD-5, 60% up
F-2	5	24.4	2.8	TD-4
F-4	5	22.7	2.7	TD-5 90% up
S-1	5	24.2	3.0	TD-5, 50% up

Table 5 : Evaluation of fibre quality from 110 days jute plant due to fungal dry retting

Code number of fungus	Root content (%)	Fibre strength (gtex-1)	Fibre Fineness (tex)	Fibre grade
F-1	5	21.5	3.1	TD-5, 70% up
F-2	8	21.9	2.8	TD-4
F-4	5	19.8	3.0	TD-4
S-1	5	24.1	2.8	TD-5, 60% up

Table 6 : Evaluation of fibre quality from 120 days jute plant due to fungal dry retting

Code number of fungus	Root content (%)	Fibre strength (gtex-1)	Fibre Fineness (tex)	Fibre grade
F-1	8	21.6	3.3	TD-5, 50% up
F-2	8	20.8	3.2	TD-5, 30% up
F-4	8	16.5	3.0	TD-5
S-1	8	19.6	3.3	TD-5, 50% up

Table 7 : Overall performance of preliminary experiment on fungal dry retting

Age of jute plant (days)	Retting time (days)	pH range	Average day temperature (°C)	Average moisture in bed (%)	Average moisture regain (%)	Average atmospheric RH (%)
90	10-11	8.74-9.20	32- 33	33-35	50-54	78
110	11-12	8.5	33			
120	12-13	7.24-7.99	30			

Conclusion

- The main advantage of dry retting is saving water required for retting which is the need of the day.
- Fungal dry retting is aerobic, so it does not produce methane.
- Fungal retting is faster and it produces good quality fibre. However, the fibre quality can be further improved with better management practice.
- It also does not produce any offensive smell so, does not produce aerial pollution.
- It is an effective tool for fighting against anthropogenic factor for global warming. Jute farmers can get carbon credit by adopting this technology.
- Government involvement is required to adopt this breakthrough technology by jute farmers

Fig 3 : Washing for fibre extraction after dry retting

Fig 4 : Fungal dry retted jute fibres

QEI-6 Development of a PLC based process control system for jute industries

Dr. G. Roy

In Jute Industries, it is often required to control the speed of the processing machineries especially for processing of value added products. Moreover it is also required to run the machines in a time delay mode.

Here we have developed such a system where we can control the complete process of the system by programming it. In the physical centre of the load points a 5 channel PLC has been installed from where control terminals has been provided to the two respective vector drive units which in turn runs the prime movers of the processing machines.

We have developed and installed the main PLC unit with two numbers of DFD unit, having provision for four other units of DFD to install. We have also installed two heavy duty ac squirrel cage induction motor as the prime mover unit of the spinning machine. A program has also been developed to run the system both in Manual and in Programming mode. In programming mode, the provision of Time delay has also been kept between the machines to run.

QEI-7 Development of a user friendly jute grading system

Dr. S. C. Saha, Dr. U. Sen and Mr. A. Ghosh

To develop a user-friendly jute grading system we interacted with farmers and industry people regarding their views about the present jute grading system and its problem. In the present BIS jute grading system

8 grades and six properties and their sub-groups are present, which are confusing to the farmers/sellers. To overcome these problems we have taken views from farmers, industry people as well as academicians. For selection of parameters and its sub-groups as well as score marks for each parameter and its sub-group, organized one workshop during the reported period with farmers, jute mill personnel, jute buyers, JCI and selected academicians on 07.09.2012. The suggestions emerged from the workshop are:

- Jute grading system has become subjective as more than 80% of the jute is graded by the middle man. Thus there is a need for awareness programme.
- As sacking bags are the major products in the jute mills but presently diversified jute products are also produced, the parameters for the new user-friendly grading system should be made accordingly.
- The user-friendly jute grading system may reduce the influence of middlemen.
- Grade should be reduced from eight to five or six keeping in mind that there should not be substantial price difference among the grades.
- Considering present jute scenario priority setting of the parameters as per use is essential.

After interaction with farmers, jute mill personnel and academicians effectively 5 grades were fixed for easy and transparent grading of jute fibre. Sub-groups of each parameter were reduced so that anyone can perform the grading of jute fibre with ease. Apart from instrumental method, hand and eye method has also been developed. Hand and eye method of grading is in practice in the market for easy transaction. Tables for instrumental and hand and eye method are given below for easy understanding. Root content is confusing so, it is changed by Lower barky content. Lower barky content is measured by length percentage instead of weight percentage for easy understanding. Sub-groups of each parameter have been reduced by 4 except fineness parameter. Fineness parameter's sub-group has been reduced to 3 instead of 4. Score marks have been changed for every parameter for proper weightage. Proposed score for jute grading (Table-11) has been given in the last. For hand and eye method (Table- 1 to 5) and for instrumental method (Table- 6 to 10) are given below:

Table 1: Score and feelings for strength parameter

Existing Group	Proposed	Feelings of breakage	Proposed Score marks
Very Good	Very Good	Need strength to break the fibre and sharp audible sound at the time of breakage	30
Good	Good	Need less strength to break the fibre and sound will be available at the time of breakage	22
Fairly Good			
Fair Average	Average	Need less strength to break the fibre and feeble sound at the time of breakage	12
Average			
Weak/Mixed	Weak/Mixed	Easily break the fibre and no sound at the time of breakage	04

Table 2 : Score and system for Root /Lower barky ends content

Existing Group range Root (wt %)	Proposed Group range Root (L%) in cm	Proposed Score marks
5	04	20
8		
10	7.5	13
15		
20	12.5	08
25		
>25	>12.5	03

Table 3 : Score for Defects

Existing Group range	Proposed Group range	Proposed Score marks
Free from major & minor defects	90% free from major & minor defects except some loose leaf and few speaks	20
90% free from major & minor defects except some loose leaf and few speaks		
80% free from major defects & substantially free from specks & loose sticks	80% free from major defects & substantially free from specks & loose sticks	15
Free from major defects	Free from major defects	10
Free from centre roots & dazed/over retted fibre & reasonably free from entangled sticks	Not more than 50% fibre should suffer from major defects	05
Not more than 50% fibre should suffer from major defects		

Table 4: Score for Fineness

Existing Group	Proposed Group	Feelings of the fibre by hand	Proposed Score marks
Very Fine	Very Fine	Very Fine	15
Fine	Fine	Not mostly fine but a few fibres may be very fine	10
Fibre well separated	Coarse	Fibres are not fine	05
Fibre separated			

Table 5 : Score And Description For Colour

Existing Group	Proposed Group	Description for colour	Proposed Score marks
Very Good	Very Good	Light creamy to reddish white	15
Good	Good	Reddish / brownish with some light grey	10
Fairly Good	Average	Light grey to copper colour	05
Fair Average			
Average	Below average	Grey to dark grey	03

Table 6 : Score for Strength Parameter

Existing Group	Proposed Group	Proposed range (gm/tex)	Proposed Score marks
Very Good	Very Good	≥ 31.0	30
Good	Good	30.9 to 23.0	22
Fairly Good			
Fair Average	Average	22.9 to 13.0	12
Average			
Weak/Mixed	Weak/Mixed	< 13.0	04

Table 7 : Score for Root /Lower barky ends content

Existing Group Root (wt.%) range	Proposed Group Root (L%) range	Proposed score marks
5	04	20
8		
10	7.5	13
15		
20	12.5	08
25		
>25	>12.5	03

Table 8 : Score for Defects

Existing Group (%)	Proposed Group (%)	Proposed score marks
Nil	0.5	20
0.5		
1.0	1.0	15
1.5	1.5	10
2.0	>1.5	05
>2.0		

Table 9 : Score for Fineness

Existing Group	Proposed Group	'Tex' value range	Proposed score marks
Very Fine	Very Fine	≤ 2.5	15
Fine	Fine	>2.5 to 3.2	10
Fibre well separated	Coarse	>3.2	05
Fibre separated			

Table 10 : Score for Colour

Existing Group	Proposed Group	Colour (%)	Proposed Score marks
Very Good	Very Good	≥ 65	15
Good	Good	64 to 50	10
Fairly Good	Average	51 to 35	05
Fair Average			
Average	Below average	< 35	03

Table 11 : Proposed Score for Grading

Grade	Strength	Root content	Defects	Fineness	Colour	Total Score
TD-1	30	20	20	15	15	100
TD-2	22	13	15	15	15	80
TD-3	12	13	15	10	10	60
TD-4	12	08	10	05	05	40
TD-5	04	03	05	05	03	20
TD-6	Entangled or any other jute not suitable for any of the above grades but of commercial value					

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, Shri P. Majumder, Shri S. B. Mondal & Shri K. Manna

Preparation of conc. methanolic extract from defatted jute seed

The shade dried jute seeds were crushed with seed crusher and a thimble was made for extraction of seed oil with a soxhlet apparatus. After the soxhlet extraction of seed oil, the defatted crushed seeds were dipped

into methanol for 7 days. After seven days the solvents were decanted and were concentrated in a distillation apparatus. The viscous solid mass obtained from the distillation were taken out and kept for drying in desiccator for further fractionation. The yield of viscous mass was 14.5%.

Column Chromatography of the methanolic extracts

The viscous mass obtained from the seed through the methanolic extraction at room temperature is then taken for rigorous column chromatography. The dry weighed sample (2g) were taken in a porcelain bowl and were mixed with silica gel G and made a free flowing slurry to load it over the column. A glass column was taken and filled with silica gel with chloroform and an auxiliary solvent. After the filling of 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.

Selection of different solvents to run the column

Solvents of different polarity 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 solvent extracts

The solvent alone or in combination were passed through the column and 50 ml fraction of the solvents was collected in an Erlenmeyer flask. The same solvent ratios were mixed and collected dried out in a vacuum evaporator. The concentrated products were undergone TLC from the same type of compound were kept together and kept for further analysis.

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 that 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 -OH stretching absorption in the compound (Fig 1).

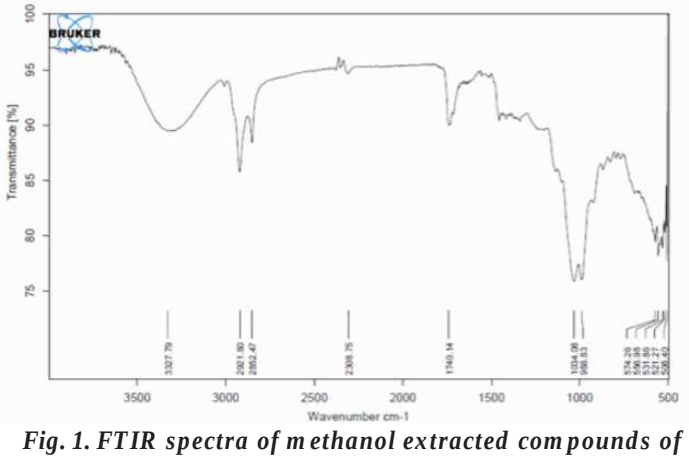


Fig. 1. FTIR spectra of methanol extracted compounds of Jute seed

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 (TD4 grade) and kept for softening and pilling. The jute was processed in jute mill in MP Division. Eight and 10, two 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 to 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/Tex.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

New extraction technology of gum from dhaincha seeds

A novel method of dhaincha gum extraction has been standardized in our laboratory which is being elaborated here under.

Method for extraction of gum from dhaincha seeds:

Step I:

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.

Step II:

Acetone was added to the funnel and shaked well. After few minutes dhaincha gum was precipitated to the bottom of the separating funnel. Then, precipitate was collected in a centrifuge tube.

Step III:

Now, it was centrifuged for 15 minutes at 210rpm. After that gum was collected in a watch glass and kept in an oven for 60 to 90 minutes at 110o C. After heating of gum, crystalline dhaincha gum was taken in vial and kept in desiccators.

On the other hand of gum extraction, after 5 to 8 days when water was fully imbibed by seeds then seeds were taken in a mortar pestle and smashed well. Sufficient distilled water was taken in a beaker and boiled at 80o C and then smashed seeds were added to it and kept for 1 to 2 hrs.

After this, it was filtered by a clean cloth and filtered materials were taken in a separating funnel and acetones was added and shaken well. Few minutes later gum was precipitated into the bottom of the separating funnel then it was collected in a centrifuge tube. After that it was centrifuged for 15 minutes at 210rpm. After that gum was collected in a watch glass and kept in an oven for 60 to 90 minutes at 110o C. After heating of gum, crystalline dhaincha gum was taken in vial and kept in desiccators.

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.

QEI 10 Online moisture measurement system for lignocellulosic fibre processing system

Dr. G. Roy & Mr. P.Singh

In jute processing system, it is often required to know about the moisture condition, especially in the breaker card. In this instrument, the three required parameters, i.e., the Relative Humidity, Moisture Content and Moisture Regain is displayed online. Computer interface is also present using USB. A photograph of the instrument is shown in the figure given below:

Online Moisture measurement Instrument

In this instrument the sensor system is placed in touch with the flow of jute and the main instrument is kept at any suitable place of the jute processing system. It can show the Relative Humidity of the environment, Moisture Content and Moisture Regain value of the jute in process.

The modification made to this instrument over the previously developed laboratory type of Digital Moisture meter is that, its time response capacity is very very fast and that is why it can sense and read the variation of the moisture content very fast which is an essential characteristics of online and real time system of measurement.

Industrial Importance

In view of the growing needs for moisture measurement in jute and jute products in different types of jute industries and research laboratories, the new instrument will be of much use and utility. As the new instrument provides accurate result and is a low cost device, it will be acceptable to all related concerns.

Development of a handy type moisture measurement meter

This is the modification of the online moisture meter.

In the jute processing unit of the mills it may not be possible to work always with this precision type of instrument for obvious reasons.

A modification has been made to the laboratory type moisture measurement built in this institute previously. By changing the sensors and replacing the microprocessor circuitry with a very powerful and small microcontroller chip it was possible to reduce the size and cost of the instrument drastically. Computer interface system is also present with this instrument using Universal Serial

Handy type Moisture Measurement Instrument

Bus (USB). Moreover, its data capturing time is also very low thus it can sense and display the result in fraction of a second. A photograph of this instrument is shown in the given figure.

The added advantages of this instrument are, using the same instrument we can get three parameters of measurement. These are:

1. Relative Humidity of the working environment
2. The Moisture Content in the test piece and
3. The Moisture Regain value

Mechanical Processing Division

Achievements

- It was possible to develop warp-knitted fabric from covered (cotton) jute yarn which is much softer and flexible than all-jute yarn. The fabric has been highly appreciated by the fashion designers and media for its aesthetic appeal at a Fashion Show at Kolkata.
- Light weight disposable carry bag of 5 kg capacity, has been sucessfully developed from jute nonwoven cloth.
- Jute-based open-mesh (leno-weave or derivatives of leno-weave) fabrics have been developed. For this, a handloom has been modified suitably. The cloth may be used for production of disposable light weight carry-bags for perishables and for agro-textiles applications.
- A fully electronically automated drawing-cum-attenuation machine has been developed for processing of all jute and jute-coconut blended fibres.

MP-1 Development of natural fibre-based geotextiles and placement system for protection of river-bank and improvement of soil stabilization

Dr. G. Basu, Dr. A. N. Roy, Dr. K. K. Satapathy & Mr. P. Sanyal

In the reporting year two field trials, (i) construction of water harvesting system and (ii) construction of unpaved (Murrum) rural road, were carried out. The required quality and quantity of geotextiles were designed and produced at our laboratory. The details of the work are given below.

Work on Construction of Water Harvesting System

The work was initiated on the request of M/s Garden Hut, Kolkata. Work for construction of rainwater harvesting system of length 220 m and vertical height 5 m for accessing the water for maintenance of the garden beautification of the complex.

Initial geotechnical information of the proposed site

- The location of the site is at ShisirKunj, Barasat, Kolkata,West Bengal. (ii) Total length of the trench (proposed work-site) = 67 m (220 ft) approx., (iii)Slant length: 6 m, (iv) Slantangle: 55°, (v) Width of trench at the top is 0.61 m (approximately) at both side of the trench, (vi) Width of trench at the bottom is 2 m (approximately), (vii) pH of the soil: 6 - 7, (viii)pH of water: 7.0, (ix) Capacity of the trench: 81,000 cuft.

Table 1 : Structural and physical parameters of optimized jute-synthetic geotextile fabric for construction

Sl No.	Parameters	Jute-synthetic blended geotextiles sheet (mat)
1	Area density (nominal value), g/m^2	330
2	Blend composition, % (Jute : PP)	60 : 40
3	Thickness, mm	1.5
4	Fabric mesh, threads/dm Warp Weft	 39 44 (Jute-PP)
5	Type of thread (i) Warp (ii) Weft	 200 tex polypropylene slit-film (flat-tape) of 2.5 mm width Cable yarn made of two strands of 360 tex jute yarns + single strand of 200 tex polypropylene fibrillated twisted yarn (both jute and PP are of circular cross-section)

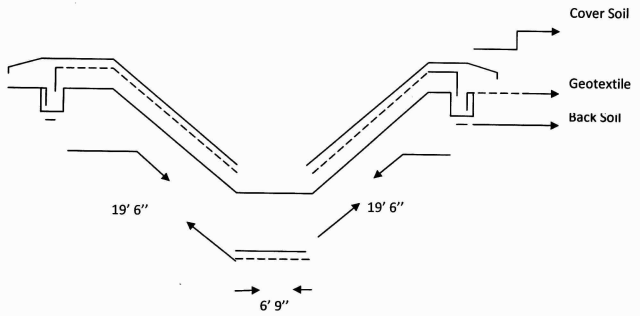


Fig 1. Geo-textile laying scheme for the work

Fig 1 shows the laying plan of geotextiles. Since the ditch was surrounded by a number of apartment buildings, there were chances of sliding of bank soil due to lateral pressure on the soil mass. So, it was decided to reinforce the soil at the base of the slants on both sides with wooden posts (pillars). The slants were dressed and soil was compacted by beating with wooden mallet. Geotextiles were placed and anchored with 25 mm diameter iron pipes and u-hooks. Geotextiles were then covered with soil (Fig 2), lightly moistened and some specified leaves and twigs were planted and some Durba grass seeds were also spread.

Fig 2 : Placing of jute-PP union fabric and covering by a layer of top soil

Fig 3 : Condition of trench two months after construction

Monitoring

After three months it was observed that both sides of the ditch have been stabilized, no swelling or deformation or cracks of soil surface was observed and vegetation was established. After ten months it was observed that vegetation has fully been established and no deformation was there. This proofs the effectiveness of geotextiles in shape retention of a water body.

Work on construction of unpaved rural road

The work was initiated on the request from Additional District Magistrate (Development) of Birbhum to construct a new unpaved (murram) road from Kayetpukur (Goalpara - DhanaiMorhPacca Road) to Uttar Sealai Village under Bolpur-Sriniketan Block Development Area. Initial survey of the work-site reveals that:

Stretch of Road: 1250 m

Width of soil-fill: 3 m to 8 m (avg 4.95 m)

Height of the soil-fill: 0.5-0.75 m

Land use pattern - Both sides of the proposed road is farm land with patches of social forestry, Mango orchard and canal irrigation system.

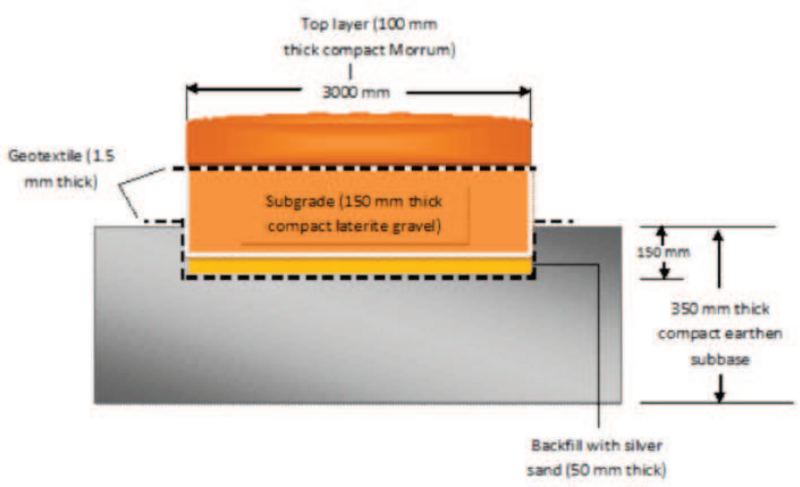


Fig 4 : Schematic diagram of proposed work

Constraints

1. No data on sub-surface and surface flow in the region is available.
2. No data on length of seasoning of soil-fill is available.

Estimated traffic volume in the first year

1. Truck - 30 per day
2. Medium weight car - 20 per day
3. Tractor - 50 per day
4. Motor bike - 80 per day
5. Cycle - more than 200 per day
6. Cycle rickshaw - 30 per day
7. Bullock cart - 200 per day

Based on the above information, detail civil engineering plan was made (Fig 4). Composite structured geotextiles were designed. Apparent opening size of the cloth was maintained lower than 250 micron, t

Fig 5 : Work-site before start of the work

Fig 6 : Anchoring of geotextiles with base soil

ensile strength 22 kN/m in both machine and cross-machine directions, and jute content 65% by weight. About 8000 m^2 geotextiles were produced at our laboratory and supplied to the site. Labour was engaged through MGNREGA by Bolpur-Sriniketan Panchayet Samity. It was noted that the geotextiles could be laid within less than 12 h by 6 trained labours up to a minimum stretch of 1 km of 3 m wide road depending up on site condition. Apparently, no such problems as crushing or melting of HDPE, or cutting or tearing of fabric due the applied dynamic load were observed during rolling. Use of such types of materials (laterite stone and Murram) for construction of low cost non-bituminous roads has been adopted as common practice in India. No notable change in fabric appearance was observed after the spreading of stones and rolling operations.

Fig 7 : After spreading of 10 mm thick sand

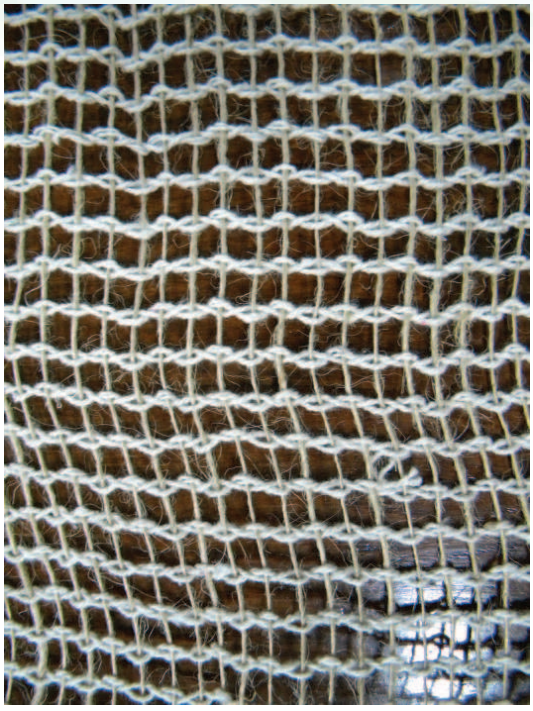
Monitoring of Field trial of river bank construction

A part of Brahmani river was reconstructed using our developed geo-textiles two years back in the month of June. It was observed during our recent visit, that the bank has been stabilized; about 75% vegetationhas been established. Average thickness of hard cake formed below the geotextiles is 125 mm (60 mm to 170 mm from upper, middle and bottom of the slant). Coconut geonet has been degraded and mixed with the soil. Jute part was already degraded within nine months after placing of geo-textiles leaving behind an open structured polypropylene tape-yarn mesh giving reinforcement to the surface soil structure. No cracks, rain cut or deformation of the dyke structure has been observed. It may be noted that for the last two years, 13-14 flash floods have been encountered by the river bank.

MP 2 Enhancing the figuring capacity of developed handloom and study of its weaving performance for speciality fabric production and product development therefrom

Dr. A. N. Roy, Dr. G. Basu & Mr. K. Mitra

Two different types of utility bags have been developed, which may be used as a replacement to the 100% synthetic or cotton bags at a competitive price. Children's winter garment with two different designs and school bags have also been developed. Winter jackets have been developed from jute/acrylic (60/40) blended yarn in collaboration with small entrepreneurs. Some wall hangings have also been developed from jute based ornamental fabrics in combination with earthen (terracotta) structures. Office bag has been developed from jute based fabric and supplied (250 numbers) for ICAR Zonal (East Zone) Committee Meeting held at Hyderabad in the month of August 2012. File folders (50 nos.) and office bags (300 nos.) was also supplied for 84th Annual General Meeting of the ICAR Society held on 18th Feb., 2013. 80 nos. office bags made from our ornamental fabric was supplied on the occasion of “North East Agri Expo 2012”



Jute-cotton union leno fabric

Grocery/shopping bag from leno fabric

held in Nov. 2012 at Dimapur, Nagaland on request of seminar committee. Successful trial was undertaken in weavers loom shed in Fulia region of West Bengal for the production of jute based ornamental fabric with two different designs. However, the maximum length of fabric that could be wound on the cloth beam was restricted to a maximum length of 20 meters of fabric of 350 GSM. Jute-cotton union leno fabrics having jute % 65 to 80 have been successfully developed in handloom and grocery/shopping bags of different designs have been developed. 100% jute open mesh fabric of three different mesh size and basis weight (190, 225 & 270 g/m2) was developed from 10 lb jute yarn in both warp and weft for different end use purpose. All the above fabrics and jute/cotton leno fabric (146gm/m2) which was developed earlier, was tested for tensile and physical properties (basis wt., ends and picks/inch and mesh size). Breaking load of the open mesh and leno fabrics were categorized in different classes to develop carry bags of different load bearing capacity.

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. N. C. Pan

Dyed and bleached Jute/linseed fibre blended yarn was tested for its optical and abrasion resistance properties. It was observed that the dye uptake % increased with the increase in linseed fibre in the blend as shown in Table 1. Abrasion resistance also increased with the increase in linseed fibre in the blend. However dyed and bleached yarn showed slightly (10 to 20%) lower abrasion resistance than the untreated (parent) yarn. Evaluation of diameter and actual twist/inch of jute /linseed fibre blended yarn was completed. The flexural rigidity of jute/linseed and jute/banana fibre blended yarn was measured with ring loop

method and compared with those of 100% jute yarn. It was observed that both jute/linseed and jute/banana fibre blended yarn showed higher flexural rigidity than 100% jute yarn. Decorative fabrics of two designs were developed from 8lb jute/linseed (25/75) fibre blended yarn in handloom. Two ornamental fabrics have been developed with 276 tex jute/banana (75/25) blended yarn in warp and 2/30s cotton yarn in weft. Ladies dress materials have been developed from the above fabrics. Men's jackets were also developed from fabric made out of jute/banana fibre, 25/75 blended yarn. The total banana fibre content in the fabric was approx. 40%. Sample fabrics were woven using 10 lb, 100% banana fibre yarn in both warp and weft with plain weave, 2/2 twill and 2/2 matt weave. The fabrics were tested for their different physical and tensile properties which has been furnished in Table 2. It was observed that 2/2 twill weave fabric showed the best results.

Table 1 : Optical evaluation of jute/ linseed blended yarn dyed with Procian Red M8B dye

Type of yarn	λ_{max} (nm)	k/s value	L	a	b	Brightness Index (TAPPI 452)
Jute/linseed, 25/75	550	6.22	43.71	41.86	-7.27	**16.62**
Jute/linseed, 50/50	550	5.92	44.38	42.82	-7.58	**18.07**
Jute/linseed, 75/25	550	5.53	44.86	43.80	-8.02	**19.68**

Table 2 : Physical and mechanical properties of banana fabrics

Type of	Fabric weight, GSM	Threads/inch		Crimp, %		Tenacity, cN/tex		Breaking extension, %		Initial modulus, cN/tex	
		Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft
Plain weave	321	12	9	9.7	4.2	2.97	3.54	7.42	4.89	26.9	49.0
2/1 twill weave	358	12	11	4.2	4.7	3.29	3.62	5.16	5.31	42.8	42.5
2/2 Matt weave	407	12	13.6	3.4	4.9	3.12	3.56	4.22	5.50	72.6	35.6

MP-5 Modification of jute spinning machinery

Dr. S. Debnath

In the existing apron draft spinning machine fine yarn less then 138 tex (4 lbs) is not possible because the twist required for this yarn is higher than 6 twist/inch. Where in the existing machine the highest twist possible is 6 twist/inch. Using CAD (computer-aided design) a compound gear has been identified as responsible gear for increase the twist. Based on this design a compound gear of 135T /24T of 8 DP (diametric pitch) instead of 120T/24T of 8 DP compound gear has been designed, fabricated and fitted in the existing machine. With this new gear the present twist constant of the machine is 229.5, which was

earlier 204. Based on the trial run since last one year with fine yarn of 3 lbs (103 tex) jute and 2.5 lbs (96 tex) jute-polyester blended yarns (where raw jute is taken as TD-4) have been spun successfully in the existing jute apron draft spinning machine with modified compound gear of 135/24 8 DP. No excessive vibration and noise has been noticed at high spindle speed up to 3500 rpm. Yarn end breakage have been measured during the processing and found that average 5 yarn breaks/spindle /hour and 3-4 for jute yarn of 3 lbs and jute-polyester 2.5 lbs yarns respectively. The yarn tenacity of these fine yarns is 7.2 and 7.8 cN/Tex for jute-polyester (96 tex) and all jute (103 tex) fine yarns respectively. Many other different yarn trials have been made in this during this yarn and no excessive vibration and noise has been observed even for coarse yarn of 8 lbs.

In another component of this project, a creel has been designed and fabricated for spinning of spun wrapped yarn in this modified apron draft jute spinning machine. This creel has facility to hold 20 yarn bobbins of different shapes (cone, cheese, etc.), having suitable yarn tension devices (ceramic disc type) and adjustable yarn withdrawal mechanism (nose / side) depending upon the bobbin. These devices has been fabricated and mounted on the creel. Fine adjustments of the creel components have to be made based on the trial run. The individual yarn break stop sensing device has been designed and fabricated. Total of 20 such yarn break sensing device have been installed in the spinning machine. During trial run it has been found that the required deflection of 3-4 mm sensing is not actuating due to excessive spring tension in the installed device where the compression spring was made out of 16 SWG (standard wire gauge). A low-tension spring of 18 SWG has been attempted which also fails to sense. However, an order has been placed now for a very low compression spring made of stainless steel of 24 SWG for this stop motion device. Other electronic devices and circuits have been procured and ready to install once the sensing device is working properly.

MP-7 Study on bending, frictional and electrical behaviour of jute materials

Dr. S. Sengupta, Dr. S. Debnath & Shri S. Das

A. Study of Frictional behaviour

- Electro-mechanical friction tester has been developed.
- Principle of test adopted: Principle of test adopted is the predetermined load having defined surface will slide horizontally on the sample and the load required to slide will be defined as frictional resistance. Higher the load, higher will be friction. The method of testing in this principle was established.
- The same sample has been tested fifteen times and it was found that difference between minimum and maximum value is insignificant at 99% confidence level.
- The testing process including size of sample, mounting of sample, size and shape of normal loading device have been optimized.
- Nonwovens, Hessian, Canvas, Knitted, Woven and coated fabric has been tested in the developed tester.

B. Study of electrical behaviour

- Literature survey has been done.
- The principle of testing electrical behaviour has been finalized.
- The design of the tester has been done.
- Fabrication work has been initiated.

Chemical & Bio-Chemical Processing Division

Achievements

- Study on “Application of biotechnology in the colouration of jute fabric” revealed that i) Sequential treatment like biotreatment-bleaching-reactive dyeing of jute fabric shows higher dye uptake than that produced by alkali treatment-bleaching-reactive dyeing of jute fabric in case of both the high exhaustion type, HE-brand reactive dyes viz. Procion Blue HERD and Procion Green HE4BD . ii) Brightness, wash fastness and handle properties of jute fabrics are better in case of biotreated - bleached-dyed jute fabrics.
- The study on “Dyeing of jute fabric using natural dyes with improved fastness properties” revealed that premordanting with sequential treatment of biomordant and chemical mordant results in substantial improvement of uniformity and levelness of dyed jute fabric using natural dyes extracted from babool , ratanjot and Red Sandalwood . All the natural dyed jute fabric produces very good UV protection properties after premordanting with bio and chemical mordant combination. UV protection properties of natural dyed jute fabric follows the order babool > Red Sandalwood > ratanjot.
- A comparative study of different pulping methods on jute and allied fibres for making value added handmade paper revealed that in case of the banana fibre, ASAM process gave the best paper with highest folding number, burst index and tear index, whereas the tensile index and the yield were almost similar to the highest yield and tensile index of the alkaline sulphite paper. The high hemicelluloses content of ASAM pulps improves beatability. The strength development starts very quickly, meaning that beating can be stopped at low degrees, which saves energy and improves porosity and draining of the paper sheet.
- The study on “Functional finishing of jute textile by suitable nano-particles” revealed that Nano silver colloidal solution is synthesized by chemical reduction method and applied on jute fabric by conventional exhaustion method. The presence of nano silver on the surface of the jute fibre was characterized by SEM with EDX.

CBP-1 A Comparative study of different pulping methods on jute and allied fibres for making value added handmade paper

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

To find the best pulping method for the three allied fibre raw materials viz. sunhemp, sisal and banana four different pulping methods viz., kraft process, alkaline sulphite process, modified alkaline sulphite Aq process (ASAM) and alkaline process were tried on the raw materials.

It was observed that in case of sisal, sunhemp and banana modified alkaline sulphite process (ASAM) gave significantly the pulp yield and high strength characteristics. Vide Table -1, 2 & 3.

In case of sisal fibre comparative pulping study by the four pulping methods i.e., kraft process, alkaline sulphite process and modified alkaline sulphite process (ASAM) and alkaline pulping process showed that the modified alkaline sulphite process (ASAM) gives the best strength properties i.e., indicated by tensile strength, tear index fold number whereas the yield was highest in case of the alkaline sulphite pulp, vide Table 1.

In case of the sunhemmp fibre comparative pulping study showed ASAM process gave the highest tensile strength, burst index and tear index, whereas the yield was almost similar to that of the alkaline sulphite pulping process, vide Table 2.

In case of the banana fibre comparative pulping process of the four processes showed that the ASAM process gave the best paper with highest folding number, burst index and tear index, whereas the tensile index and the yield were almost similar to the highest yield and tensile index of the alkaline sulphite paper, vide Table 3.

There is renewed interest in recent years to find alternatives to the kraft system that will yield pulp with kraft like strength properties, but without environmental drawbacks.

The strength properties of ASAM pulps are superior to those of any kraft pulp. This is corroborated by the ASAM pulp made from jute vide Table 1, 2 & 3. The high tensile strengths, which are based on the good bonding ability of the fibres, are mainly the result of the high hemicellulose content of these pulps. The ASAM process yields the highest hemicelluloses content in the outer cell wall layers, which are the primary (P) and outer secondary wall (S1). The high tear strength of ASAM pulps is probably due to the smoother pulping conditions, leaving the carbohydrates at a high degree of polymerization.

The high hemicelluloses content of ASAM pulps improves beatability. The strength development starts very quickly, meaning that beating can be stopped at low degrees, which saves energy and improves porosity and draining of the paper sheet.

TABLE -1

SISAL

Sample Jute	Yield (%)	Freeness °SR	G.S.M	Folding	Tensile Index Nm / g	Tear Index mNm^2 / g
ASAM (160°C) 3 hr	68.4	51	64	622	85.83	13.75
Sulphite (160°C) 3 hr	73.0	52	64	563	72.54	10.94
Kraft (160°C) 3 hr	61.5	54	63	193	52.0	11.43
17% NaOH (160°C) 3 hr	62.3	50	58	407	81.18	11.03

TABLE -2

SUNHEMP

Sample Jute	Yield (%)	G.S.M	Folding	Tensile Index Nm / g	Burst Index $KPam^2$ / g	Tear Index mNm^2 / g
Na_2SO_3, 160°C, 3hr	69.8	62	1567	56.95	3.81	20.0
17% NaOH, 160°C, 3hr	67.5	58	327	50.74	3.50	15.17
Kraft, 160°C, 3hr	65.2	60	252	54.49	3.43	11.34
ASAM 160°C, 3hr	68.7	66	1946	63.41	3.97	16.36

TABLE - 3

BANANA

Sample Jute	Yield (%)	Freeness °SR	Folding	Tensile Index Nm / g	Burst Index KPam2 / g	Tear Index mNm2 / g
Banana Kraft Temp-160°C, time- 3hr	52.5	46	2477	75.60	7.72	7.5
Banana ASAM Temp-160°C, time- 3hr	53.9	45	4080	78.88	8.67	9.52
Banana Na_2SO_3 Temp-160°C, time- 3hr	55.2	45	3635	83.39	7.87	5.80
Banana 10% NaOH Temp-160°C time- 3hr	55.7	43	3254	70.27	7.27	6.87

CBP-4 Dyeing of jute fabric using natural dyes with improved fastness properties

Dr. S. N. Chattopadhyay, Dr. N. C. Pan & Shri A. Khan

Grey jute fabric was scoured and bleached with hydrogen peroxide by conventional process. Weight loss of jute fabric was 3.5% and 4.6 % respectively during scouring and bleaching operation. The bleached fabrics were mordanted with biomordant (myrobolan & pomegranate) and chemical mordant (ferrous sulphate & potash alum) by a single as well as double mordanting method.

The fabric becomes absorbent and white after scouring and bleaching. It is clear that except potash alum other mordants have their own colour and they impart some colour to the bleached fabric so, K/S increases and whiteness index & brightness index decreases. Ferrous sulphate in combination with biomordants produces dark colour in the mordanted jute fabric. All the bleached and mordanted jute fabric were subsequently dyed with natural dye extracted from ratanjot, babool and Red sandalwood.

Alkaline medium was found to be best for extraction of natural dye from ratanjot. Bleached fabric was dyed with ratanjot for 1 hr, 2 hr, 3 hr and their dyeing behaviour and fastness properties were evaluated. Dyeing for 2 hour duration was found to be optimum.

Jute fabric was dyed with ratanjot at alkaline mediun for two hours following both premordanting and postmordanting technique, optical properties were evaluated using computer colour matching system and has been tabulated in Table-1. Detailed analysis of results revealed that all the pre mordanting samples produces better colour yield. Double pre mordanting and dyeing of fabric produces higher colour yield and CV% of K/S value is low indicating level dyeing. In case of post mordanting CV% of K/S is also high. Ratanjot dyed fabric shows higher b value than a value, so the shades are bluish in nature.

Table 1 : Dyeing properties of pre and post mordanted ratanjot dyed jute fabric

Dyed sample	λ_{max} (nm)	Colour value		L	a	b
		K/S	CV%			
Control	420	1.17	4.73	60.47	1.04	3.93
Ferrous sulphate > Dyeing	420	3.66	4.22	45.41	5.04	8.42
Potash alum > Dyeing	420	2.33	3.23	52.52	2.89	7.73
Myrobolan > dyeing	420	2.66	4.15	51.99	3.23	9.12
Pomegranate > Dyeing	420	1.43	3.32	58.05	1.46	4.80
Myrobolan > Ferrous sulphate > Dyeing	460	8.54	1.22	34.16	-0.77	8.96
Myrobolan > Potash alum > Dyeing	420	5.34	1.47	44.66	3.56	13.67
Pomegranate > Ferrous sulphate > Dyeing	430	4.68	1.45	40.29	5.39	6.98
Pomegranate > Potash alum > Dyeing	420	3.52	0.98	48.13	3.89	10.60
Dyeing > Ferrous sulphate	420	2.95	3.62	55.22	7.00	17.41
Dyeing > Potash alum	420	1.10	4.17	62.00	1.26	4.86
Myrobolan > dyeing > Ferrous sulphate	420	5.13	2.89	42.31	4.94	10.28
Myrobolan > dyeing > Potash alum	420	2.99	2.61	49.59	1.86	8.56
Pomegranate > dyeing > Ferrous sulphate	420	2.75	3.11	51.00	5.21	11.20
Pomegranate > dyeing > Potash alum	420	1.40	1.96	58.20	0.56	4.77

It has been found that premordanting improves the wash fastness properties and reaches very good to excellent for double premordanted fabric. Light fastness is found to be moderate for all the dyed samples. Both dry and wet rubbing fastness is good for control and single mordanted dyed fabric but further improvement is found in case of double premordanting.

Bleached jute fabric was dyed with natural dye extracted from babool for different duration of dyeing and it was found that dyeing for two hours produces maximum colour yield and wash fastness properties.

Table 2 : Dyeing properties of pre and post mordanted babool dyed jute fabric

Dyed sample	^{a}max (nm)	Colour value		L	a	B
		K/S	CV%			
Control	470	3.07	5.99	48.78	12.37	10.74
Ferrous sulphate > Dyeing	480	8.50	3.31	30.67	8.13	3.62
Potash alum > Dyeing	470	3.78	4.85	42.75	13.48	14.34
Myrobolan > dyeing	450	3.29	3.73	44.89	12.19	13.47
Pomegranate > Dyeing	430	3.12	4.56	43.95	8.72	1.54
Myrobolan > Ferrous sulphate > Dyeing	540	12.33	2.01	27.24	8.55	2.82
Myrobolan > Potash alum > Dyeing	430	5.65	2.19	43.75	11.78	18.34
Pomegranate > Ferrous sulphate > Dyeing	490	7.96	1.38	30.70	7.20	3.81
Pomegranate > Potash alum > Dyeing	460	4.72	2.16	42.72	13.71	16.05
Dyeing > Ferrous sulphate	470	6.99	3.96	33.27	6.90	4.08
Dyeing > Potash alum	460	3.18	3.21	48.36	11.25	11.31
Myrobolan > dyeing > Ferrous sulphate	550	12.17	4.62	24.08	4.52	-1.16
Myrobolan > dyeing > Potash alum	450	3.69	3.59	47.28	10.21	13.33
Pomegranate > dyeing > Ferrous sulphate	510	5.61	4.19	34.79	6.35	0.58
Pomegranate > dyeing > Potash alum	420	2.83	2.96	49.99	11.36	10.80

So, dyeing of bleached jute fabric with babool was carried out by following different mordanting technique for two hours in neutral medium. All the dyed samples were evaluated in computer colour matching system and their results have been tabulated in Table-2. Analysis of results shows that different shades are produced using different mordants and method of mordanting. In this case a value is found to be higher than b value indicating reddish shade. Premordanting method produces higher colour yield and double premordanting produces maximum level dyeing as the CV% of K/S value is minimum in this case.

Control sample produces poor wash fastness but premordanting improves the wash fastness and reaches maximum in case of double premordanting. All the mordanted sample shows moderate light fastness. Rubbing fastness is found to be good to excellent for all the babool dyed jute fabrics.

2 hours duration of dyeing was standardised for dyeing of jute fabric with natural dyes extracted from red sandalwood. Dyeing of bleached jute fabric with red sandalwood was carried out by following different mordanting technique for two hours in neutral medium. All the dyed samples were evaluated in computer colour matching system and their results have been tabulated in Table-3. Analysis of results shows that

different shades are produced using different mordants and method of mordanting. In this case b value is found to be higher than a value indicating bluish shade. Premordanting method produces higher colour yield and double premordanting produces maximum level dyeing as the CV% of K/S value is minimum in this case.

Table 3 : Dyeing properties of pre and post mordanted Red Sandalwood dyed jute fabric

Dyed sample	^{a}max (nm)	Colour value		L	a	B
		K/S	CV%			
Control	420	2.64	6.99	55.36	20.10	17.00
Ferrous sulphate > Dyeing	420	6.08	4.31	49.31	15.74	22.30
Potash alum > Dyeing	420	3.50	4.95	57.03	22.08	25.69
Myrobolan > dyeing	420	4.58	4.23	50.04	12.99	17.94
Pomegranate > Dyeing	420	2.19	5.56	59.41	16.59	16.37
Myrobolan > Ferrous sulphate > Dyeing	420	14.01	1.91	25.54	6.24	5.33
Myrobolan > Potash alum > Dyeing	420	6.93	2.19	51.55	15.23	26.06
Pomegranate > Ferrous sulphate > Dyeing	420	6.35	2.38	45.25	14.34	17.98
Pomegranate > Potash alum > Dyeing	420	6.29	2.66	53.17	21.84	29.99
Dyeing > Ferrous sulphate	420	5.29	4.06	51.47	11.88	21.01
Dyeing > Potash alum	420	2.92	3.71	58.89	15.30	19.82
Myrobolan > dyeing > Ferrous sulphate	420	9.11	3.92	35.66	5.49	9.95
Myrobolan > dyeing > Potash alum	420	5.42	3.57	52.24	11.87	21.53
Pomegranate > dyeing > Ferrous sulphate	420	4.70	4.19	53.75	12.53	25.67
Pomegranate > dyeing > Potash alum	420	2.54	3.16	58.29	17.52	19.46

Control sample produces poor wash fastness but premordanting improveds the wash fastness and reaches maximum in case of double premordanting. All the mordanted sample shows moderate light fastness. Rubbing fastness is found to be good to excellent for all the Red Sandalwood dyed jute fabric.

Ultraviolet protection properties of grey, scoured, bleached, mordanted and mordanted-dyed samples were evaluated following AATCC method and tabulated in Table 4, Table-5, Table-6 and Table-7.

Plain weave grey, scoured and bleached jute fabric shows poor UV protection property and transmission of solar radiation both UV-A and UV-B are very high. There is an improvement of UPF (ultraviolet protection factor) of jute fabric after single mordanting but the rating is still poor which is evident from Table-8. Double mordanting of jute fabric results in further improvement of UPF rating and UV protection is found to be good in this case.

Table 4 : UV protection properties of mordanted samples

Dyed sample	UV-Protection Factor (UPF)		UPF rating	% Transmittance	
	Mean	SD		UV-A	UV-B
Grey	8.50	0.88	5.00	12.86	11.74
Scoured	11.44	3.32	5.00	11.12	9.32
Scoured-Bleached (B)	16.25	2.51	10.00	10.70	7.14
B+ Ferrous sulphate	18.92	5.75	10.00	6.22	5.64
B + Potash alum	19.28	3.94	10.00	6.05	5.32
B+ Myrobolan	19.29	7.71	10.00	6.78	5.83
B+ Pomegranate	16.10	4.28	10.00	7.85	6.34
B+ Myrobolan + Ferrous sulphate	23.06	5.38	15.00	4.86	4.53
B+ Myrobolan + Ferrous sulphate	25.50	8.63	15.00	4.92	4.21
B+ Pomegranate + Ferrous sulphate	18.85	2.41	15.00	6.06	5.27
B+ Pomegranate + Potash alum	17.32	3.96	15.00	7.23	5.71

Table 5 : UV protection properties of Ratanjot dyed samples

Dyed sample	UV-Protection Factor (UPF)		UPF rating	% Transmittance	
	Mean	SD		UV-A	UV-B
Control	21.47	5.02	15.00	6.66	4.68
Ferrous sulphate > Dyeing	21.92	2.83	20.00	5.25	4.51
Potash alum > Dyeing	20.19	4.32	15.00	5.20	4.11
Myrobolan > dyeing	25.64	5.07	20.00	4.77	3.90
Pomegranate > Dyeing	19.50	3.03	15.00	6.57	5.04
Myrobolan > Ferrous sulphate > Dyeing	25.54	7.62	25.00	4.45	4.10
Myrobolan > Potash alum > Dyeing	20.41	5.82	20.00	5.63	5.15
Pomegranate > Ferrous sulphate > Dyeing	18.62	3.87	20.00	6.23	5.46
Pomegranate > Potash alum > Dyeing	21.67	5.84	20.00	5.65	4.82

Table 6 : UV protection properties of babool dyed samples

Dyed sample	UV-Protection Factor (UPF)		UPF rating	% Transmittance	
	Mean	SD		UV-A	UV-B
Control	40.55	7.70	30.00	3.10	2.67
Ferrous sulphate > Dyeing	41.61	6.28	30.00	3.17	2.39
Potash alum > Dyeing	39.18	3.26	30.00	3.11	2.49
Myrobolan > dyeing	37.63	2.69	30.00	3.26	2.51
Pomegranate > Dyeing	38.53	1.97	30.00	3.21	2.63
Myrobolan > Ferrous sulphate > Dyeing	47.13	6.31	35.00	2.97	2.35
Myrobolan > Potash alum > Dyeing	47.38	7.26	35.00	3.05	2.31
Pomegranate > Ferrous sulphate > Dyeing	44.48	3.91	35.00	3.01	2.58
Pomegranate > Potash alum > Dyeing	43.87	4.83	35.00	2.91	2.46

Table 7 : UV protection properties of Red Sandalwood dyed samples

Dyed sample	UV-Protection Factor (UPF)		UPF rating	% Transmittance	
	Mean	SD		UV-A	UV-B
Control	33.27	7.68	25.00	4.27	3.20
Ferrous sulphate > Dyeing	36.18	6.19	25.00	4.16	3.18
Potash alum > Dyeing	38.29	3.79	25.00	4.17	3.26
Myrobolan > dyeing	33.36	4.77	25.00	4.08	3.11
Pomegranate > Dyeing	35.51	2.36	25.00	4.11	3.08
Myrobolan > Ferrous sulphate > Dyeing	41.63	1.18	30.00	3.19	2.66
Myrobolan > Potash alum > Dyeing	43.68	2.11	30.00	3.07	2.53
Pomegranate > Ferrous sulphate > Dyeing	42.66	2.01	30.00	3.11	2.43
Pomegranate > Potash alum > Dyeing	39.69	2.16	30.00	3.12	2.39

Only ratanjot dyed sample shows good UV protection properties whereas it is very good in case of babool and Red Sandalwood. Single mordanting of jute fabric prior to natural dyeing does not produce any further improvement of UPF rating but there is decrease in transmission level of UV-A and UV-B radiation than that produced by only natural dyed jute fabric which is clear from Table-12, Table-13 and Table-14. Double premordanting of jute fabric before natural dyeing is accompanied by improvement of UV-Prptection properties irrespective of mordants used. Maximum UV protection is found in case of myrobolan -ferrous sulphate pretreatment. Improvement of UV protection is mainly attributed to the synergistic effect of mordant and natural dyes thereby maximising the extent of UV protection and minimising the extent of UV transmittance.

FTIR spectrogram of grey, scoured, bleached and natural dyed samples revealed well defined bands around 3400 cm^{-1}, 2900 cm^{-1}, 1740 cm^{-1}, 1650 cm^{-1}, 1250 cm^{-1}, 1110 cm^{-1} and 1050 cm^{-1} are present in the spectra of jute. The bands around 3400 cm^{-1} and 2900 cm^{-1} corresponds to -OH stretching of cellulose. The bands around 1740 cm^{-1} corresponds to CO- stretching of hemicelluloses and the remaining bands belong to CO and C-O-C stretching of lignin.

In the spectrum of hydrogen peroxide bleached jute, the band intensities at 1735 cm-1 reduces drastically as compared to grey and scoured jute due to saponification of ester group during peroxide bleaching. The band near 1465 cm^{-1} in the spectra contribute to lignin and hemicelluloses constituent of jute. The band around 1203 cm^{-1} arise from four chemical constituents like cellulose, lignin, xylan, etc corresponding to C-H and CH_2 groups which is reduced after natural dyeing due to possible interaction of natural dyes with these groups particularly in case of manjistha. Several weak peaks and necks are generated in spectrogram after natural dyeing around band 1651 cm^{-1}, 1598 cm^{-1}, 1203 cm^{-1} and 900 cm^{-1} indicating possible interaction of natural dyes with jute fibre. Reduction in band around 900 cm^{-1} in bleached fabric signifies some marginal loss of lignin. But the bands in this region become stronger in case of annatto and babool dye due to C-H out-of-plane vibrations. Several weak and neck peaks in the region 600-900 cm^{-1} disappears after dyeing with ratanjot.

CONCLUSIONS

1. Premordanting with sequential treatment of biomordant and chemical mordant results in substantial improvement of uniformity and levelness of dyed jute fabric using natural dyes extracted from babool, ratanjot and Red Sandalwood.

2. Double mordanting produces high K/S value after natural dyeing and wash fastness of good to excellent rating is achieved. Natural dyes show moderate to good light fastness properties but rubbing fastness is very good to excellent irrespective of method of dyeing.

3. Grey, scoured and bleached jute fabrics have no UV protection properties. UPF values as well as protection grades of the natural dyed jute fabrics is good. Babool and Red Sandalwood show very good UV protection rating.

4. All the natural dyed jute fabric produces very good UV protection properties after premordanting with bio and chemical mordant combination. UV protection properties of natural dyed jute fabric follows the order babool > Red Sandalwood > ratanjot.

5. Complete saponification of ester group is indicated after hydrogen peroxide bleaching in FTIR spectrogram. Disappearance, reduction and generation of some new peaks in the FTIR spectrograms of natural dyed jute fabric may be due to possible formation of weak bond between natural dye and jute fibre.

CBP-5 Application of biotechnology in the colouration of jute fabric

Dr. N. C. Pan & Dr. S. N. Chattopadhyay

Four sets of dyed jute fabric samples were prepared for the study as under:

Chemical scouring of raw jute fabric using sodium hydroxide and non-ionic surface active agent - bleaching of chemically scoured jute fabric using hydrogen peroxide as bleaching agent - dyeing of chemically scoured & bleached jute fabrics separately with high exhaustion type, HE-brand reactive dyes viz. Procion Blue HERD and Procion Green HE4BD

Bioscouring of raw jute fabric using cellulase enzyme (Ezysoft LCP) , xylanase enzyme (Texzyme J) and non-ionic surface active agent - bleaching of bioscoured jute fabric using hydrogen peroxide as bleaching agent - dyeing of bioscoured & bleached jute fabrics separately with high exhaustion type, HE-brand reactive dyes viz. Procion Blue HERD and Procion Green HE4BD.

Four sets of dyed fabrics were evaluated for comparison by using different standards for the properties namely whiteness index, yellowness index, brightness index, ^{a}max(nm) , K/S value, L, a, b values, wash fastness, light fastness, handle property, tensile property. Results are tabulated below (Table 1 and 2).

Table 1: Dyeing properties of chemically scoured-bleached-dyed and bioscoured-bleached-dyed jute fabrics (Dyed with Procion Blue HERD and Procion Green HE4BD dyes)

Jute Fabric	λ_{max} (nm)	K/S value	L	a	b	Wash fastness	Light fastness
Chemically scoured-bleached-dyed with Procion Blue HERD dye	610	11.80	28.09	0.92	-19.65	4	4
Bioscoured-bleached-dyed with Procion Blue HERD dye	610	12.07	27.83	1.32	-19.21	4-5	4
Chemically scoured-bleached-dyed with Procion Green HE4BD dye	580	10.77	26.09	0.60	-4.65	4-5	4
Bioscoured-bleached-dyed with Procion Green HE4BD dye	580	11.61	26.09	0.90	-5.12	5	4

Table 2: Handle properties of grey, chemically scoured-bleached, bioscoured-bleached, chemically scoured-bleached-dyed and bioscoured-bleached-dyed jute fabrics (Dyed with Procion Blue HERD and Procion Green HE4BD dyes)

Jute fabric	Bending length (cm)		Flexural rigidity (mg.cm)		Bending modulus (kg/cm^2)	
	Warp	Weft	Warp	Weft	Warp	Weft
Grey	4.68	4.80	2101	2267	44.09	44.57
Chemically scoured-bleached	3.07	3.16	660	719	9.84	10.72
Bioscoured-bleached	2.81	2.95	537	621	8.01	9.26
Chemically scoured-bleached-dyed with Dyed with Procion Blue HERD dye	3.10	3.15	679	712	10.12	10.62
Bioscoured-bleached-dyed with Dyed with Procion Blue HERD dye	3.05	3.12	646	692	9.63	10.32
Chemically scoured-bleached-dyed with Procion Green HE4BD dye	3.05	3.10	652	685	9.12	9.58
Bioscoured-bleached-dyed with Procion Green HE4BD dye	3.08	3.13	672	705	9.40	9.86

From the test results, it is concluded that:

- Sequential treatment like biotreatment-bleaching-reactive dyeing of jute fabric shows higher dye uptake than that produced by alkali treatment-bleaching-reactive dyeing of jute fabric in case of both the high exhaustion type, HE-brand reactive dyes viz. Procion Blue HERD and Procion Green HE4BD .
- Removal of impurities as well as removal of small amount of jute constituent during bio-treatment results in easy access of the dye molecules.
- Brightness of the shade was improved in case of biotreated jute fabric.
- Wash fastness properties are slightly better in case of biotreated - bleached-dyed jute fabrics.
- Bio-treatment results in improvement of handle properties of jute fabric.
- There is a small drop of tensile strength after biotreatment.

CBP-6 Energy from jute and agro-residue biomass

Dr. L. K. Nayak & Shri K. Patra

Energy is the key input for technological, industrial and socio-economic development of a Nation. The technology of deriving energy from renewable bio-resources has been receiving much attention globally. Jute stick, agro-waste and jute caddies, mill waste are potential raw materials for generation of bio-energy. Jute stick is a pale coloured, highly porous hence very light and voluminous, woody structure of the jute plant around which the fibres form skin or the bark. The estimated amount of jute stick available in India per annum is about 4 million tones. Most of it is used for domestic purposes as fuel; temporary fencing, etc., whereas, a small fraction of it is used industrially. The jute industry generates about 40,000 tonnes of processing waste as by-products, commonly known as jute caddies. The major constituent of this waste is un-spinnable jute fibre. The other constituents are batching oil, machine oil and grease, barks of jute plant and in-organic dirts. Traditionally the jute industry used this waste along with coal as fuel for the boiler to generate steam which was required to run the sizing and calendaring machines. Use of caddies as a fuel is problematic, mainly due to its poor fuel value and thermal efficiency.

Charring of Jute stick

The carbonization of jute stick was done in a cylindrical shaped stainless steel drum of size 1100 mm x 800 mm, designed and fabricated at NIRJAFT, Kolkata. The drum is having an out let door with cloth/felt gasket and also provided with a tray for collection of charcoal. Jute stick was fed into the charring drum and ignited, after which the lid of the drum was closed. Charcoal was produced in a period of 1.5 hr.

Briquetting of jute stick charcoal

Briquettes from jute stick charcoal was prepared in a machine with the specifications viz. feed capacity 25 Kg/hr, screw diameter - 160 mm, screw length - 600 mm, orifice diameter - 30 mm, cutting length - 120 mm and power supply - 440 Volts after mixing it with different binders.

Thermal analysis (TGA and DTA) of jute stick briquettes have been performed from 40°C to 1500°C @ 10°C/ min. Measuring instrument used was NETZSCH make STA 449C. Surface area of samples has been measured by BET method. Measuring instrument used was Quantachrome make NOVA 4000e. BET analysis of the sample at five relative pressure points was obtained. For measuring carbon content the instrument used was LECO C 600 Carbon analyzer.

The jute stick briquettes recorded exothermic peaks at 455.5°C and 547.2°C and endothermic peak at 1404°C. Corresponding mass loss was 77.70% (Figure 3).

Specific surface area was measured to be 1.428 m^2/g. The calorific value and carbon content of jute stick briquettes were found to be 4447.63 Kcal/Kg and 58.80% respectively.

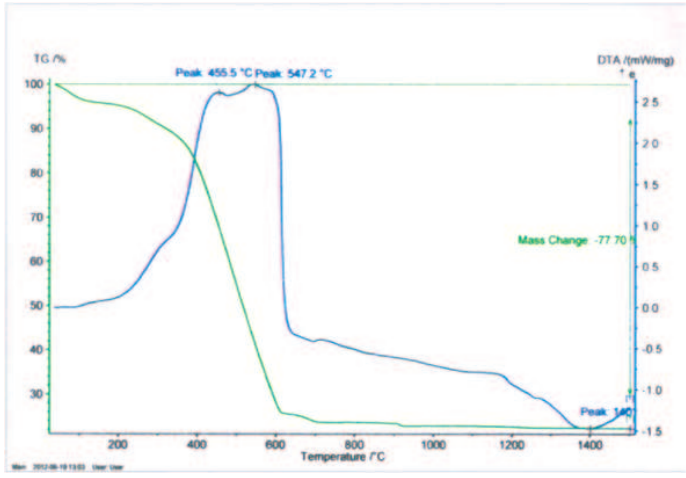


Figure 3 : TGA and DTA Curves for jute stick briquettes

Every year thousands of tons of jute stick and jute caddies are burnt inefficiently in loose form causing air pollution. Handling and transportation of this waste is difficult due to low bulk density. These wastes can provide a renewable source of energy by converting them into high density briquettes through charring and pelletization.

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

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

A study was done to evaluate the effect of biotreatment on pulping of jute fibre. Two commercial enzyme, Texbio-M (Cellulas and hemicellulase based enzyme) and Texzyme J (Xylanase based enzyme) was procured from M/s Tex Biosciences (P) Ltd, Chennai and applied on jute fibre. Then pulping of control and enzyme treated fibre was carried out following hot soda process and cold soda process. The different steps are as follows :

Enzyme treatment : Jute fibre was treated with a mixture of enzyme , Texbio M (2 ml/L) and Texzyme J (2 ml/L) using material to liquor ratio 1:10 at a temperature of 50- 55°C for two hours. The pH was maintained at 8-9 by using sodium carbonate buffer. After the treatment, the samples were boiled for 30 min and washed thoroughly.

Hot soda pulping : Controlled and enzyme teated fibres were boiled for three hours in open vessel using different caustic concentrations (2%, 4%, 8%) using liquor ration of 1:10. After the digestion, the pulps were washed thoroughly with running water.

Cold soda pulping : Control jute fibres was soaked in a 10% NaOH solution and enzyme treated fibres were soaked in a 4%,7% & 10% NaOH solution at 1:10 material to liquor ratio for 24 hrs. The material was washed free of alkali with running water.

Beating : Enzyme treated fibres, hot soda pulps and cold soda pulps were subjected to beating in laboratory scale valley type beater for different durations to produce pulp of 400SR freeness.

Paper sheet formation: Paper sheets of 60 GSM were produced by using semi automatic paper sheet making machine.

Following hot soda samples were prepared:

- Sample A : Hot soda pulping of jute fibre was done by using 8% sodium hydroxide by open digestion process.
- Sample B : Enzyme treated sample
- Sample C : Enzyme treatment & hot soda pulping using 2% sodium hydroxide
- Sample D : Enzyme treatment & hot soda pulping using 4% sodium hydroxide
- Sample E: Enzyme treatment & hot soda pulping using 8% sodium hydroxide

Evaluation : All the paper sheets were kept in the standard testing atmosphere 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 handmade paper produced by hot soda process and cold soda process was determined by Spectrascan-5100 computerised colour matching system using relevant software.

Physical properties : Tensile properties were evaluated by Tappi Test Method - T404 om-85, Bursting Index was determined by Tappi Test Method - T403 om-85, Tearing strength by Tappi Test Method - T414 om-88 and Folding endurance (Schopper type) was determined by Tappi Test Method - T423 om-89.

The results of evaluation of hot soda samples were tabulated in table 1 and table 2.

TABLE - 1

Sample code	Loss in weight (%)		Yield (%)	Whiteness Index	Yellowness Index	Brightness Index
	Enzymolysis	Pulping				
A	-	19.5	80.5	60.41	35.05	30.93
B	7.6	-	92.4	63.04	30.16	34.86
C	7.6	4.0	88.4	59.60	33.07	30.58
D	7.6	5.0	87.4	59.59	32.68	30.78
E	7.6	10.1	82.3	61.38	34.42	32.17

TABLE - 2

Sample code	Freeness (0SR)	GSM	Fold endurance	Tensile Index (Nm/g)	Burst Index ($KPam^2/g$)	Tear Index (mNm^2/g)
A	38	60	190	59.94	3.53	10.67
B	40	57	5	25.24	1.17	5.26
C	37	60	73	56.67	3.55	10.10
D	37	64	310	67.43	4.59	14.04
E	39	57	136	56.53	3.66	9.84

Following cold soda samples were prepared :

- Sample A : Jute fibres were subjected to cold soda pulping using 10% sodium hydroxide at ambient temperature.
- Sample B : Enzyme treated sample
- Sample C : Enzyme treated fibres were subjected to cold soda pulping using 4% sodium hydroxide at ambient temperature.
- Sample D : Enzyme treated fibres were subjected to cold soda pulping using 7% sodium hydroxide at ambient temperature.
- Sample E: Enzyme treated fibres were subjected to cold soda pulping using 10% sodium hydroxide at ambient temperature.

Results of evaluation of cold soda samples are tabulated in table-3 & table-4.

TABLE -3

Sample code	Loss in weight (%)		Yield (%)	Whiteness Index	Yellowness Index	Brightness Index
	Enzymolysis	Pulping				
A	-	3.6	96.4	50.45	49.64	20.18
B	7.6	-	92.4	63.04	30.16	34.86
C	7.6	2.6	89.8	54.33	37.54	25.02
D	7.6	4.2	88.2	59.61	35.21	30.20
E	7.6	4.8	87.6	60.29	34.10	32.02

TABLE -4

Sample code	Freeness (0SR)	GSM	Fold endurance	Tensile Index (Nm/g)	Burst Index ($KPam^2/g$)	Tear Index (mNm^2/g)
A	41	63	30	28.23	2.33	6.97
B	40	57	5	25.24	1.17	5.26
C	43	56	134	52.55	3.48	7.86
D	41	60	248	59.58	4.38	10.33
E	45	59	192	57.20	3.64	10.50

Yield of the pulp is about 80% in case of hot soda pulp using 8% caustic concentration. Enzymolysis results in 8% loss in weight of jute fibre. Yield of the pulp produced by sequential treatment of enzyme and hot soda pulping is high ie. 88%, this may be due to the use of low alkali concentration during the digestion process. Yield is also high in case of enzyme treatment followed by cold soda pulping. Analysis of table 2

reveals that paper produced by hot soda process results in good physical properties but only enzyme treated fibre shows poor tensile and folding property. Pulping of enzyme treated fibre results in improvement of strength and folding properties of paper using only 4% sodium hydroxide concentration during pulping. Further increase in alkali concentration shows no improvement. Cold soda pulping of enzyme treated fibre also shows encouraging performance. Enzyme treatment followed by cold soda pulping using 7% (owf) NaOH, produces paper with high brightness and physical properties and comparable to that produced by hot soda pulping which are clear from table-3 and table-4.

It is concluded that (i) better yield of the pulp and improvement of quality of paper can be obtained using combination of enzyme treatment and chemical pulping using lower dose of chemical (ii) better yield of the pulp and improvement of quality of paper can be obtained using combination of enzyme treatment and chemical pulping at lower temperature.

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

Dr. N. C. Pan

The term particle board refers to products generally made by reducing wood to small particles and reforming these particles into rigid panels using an adhesive as the binder of particles. Present study is based on using bio-adhesives in place of synthetic resin. Bio-adhesives are biodegradable and environment friendly in nature. In this study, a biodegradable adhesive, Chitosan, is used. Chitosan is a polysaccharide (amino sugars) obtained by deacetylating Chitin, a natural biopolymer originating from the shells of crustaceans like shrimp, lobster, crabs and other shellfish. Chitosan is a cationic polymer and finds multifarious applications in textiles.

The process of making particle board using cassava stalk is as under:

Cassava stalks were cut into small pieces and chipped in grinding machine. Chipped particles after uniform mixing with bio-adhesive, Chitosan, in different concentration (1%, 3%, 5%) 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 1600C, pressure 200 Kgf/cm_2 and time 30 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 boards were evaluated for different physical properties viz, flexural strength, flexural modulus, moisture uptake (24h), etc following standard procedure and tabulated in Table-1 and Table-2.

Table 1: Mechanical properties of cassava stalk boards using bioadhesive, Chitosan

Sl No	Cassava stalk particle board using	Flexural strength (MPa)	Flexural modulus (GPa)
1	1% Chitosan	2.33	0.55
2	3% Chitosan	2.99	0.65
3	5% Chitosan	4.75	0.84

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

Sl No	Cassava stalk particle board using	ILSS (N/mm2)	Moisture uptake(24h) %
1	1% Chitosan	0.07	8.87
2	3% Chitosan	0.09	8.91
3	5% Chitosan	0.13	8.67

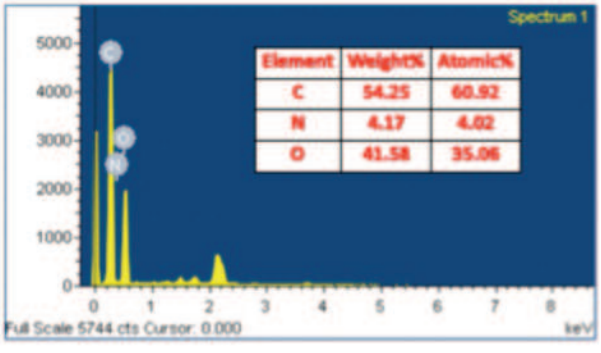
Making of particle board using bio-adhesive, Chitosan, shows encouraging results and detailed study is under progress.

CBP-9 Functional finishing of jute textile by suitable nanoparticles

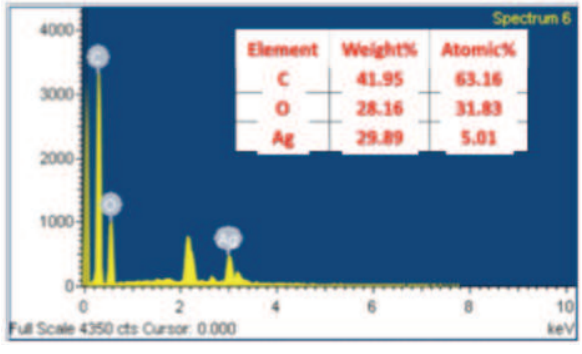
Dr. L. Ammayappan & Dr. D. P. Ray

Pre-project work was carried by selecting silver nitrate for the synthesis of silver nanoparticle. The silver nanoparticle was synthesized by in-situ method on jute fabric. To enhance the in-situ synthesis of silver nanoparticle, jute fabric was pretreated with four different pretreatments i.e. 5% NaOH (owm) / 30°C/ 60minutes/1:10 MLR, 10% Alcoholic NaOH /30°C/ 60minutes/1:10 MLR, 2% $NaHSO_3$ (owm)/45°C/ 60minutes, and conventional scouring. Pre-treated jute fabric was entered in a bath containing silver nitrate solution (100mM $AgNO_3$) with 1: 20 MLR at pH 5.5 (with acetic acid solution) and treated at 40°C for 15 minutes. Then the bath temperature was raised to 90°C @ 2°C/minute and treated at 90°C for 60 minutes. After treatment, the bath temperature was gradually reduced to 40°C, and then sample was taken out, washed with distilled water and dried at ambient condition. The nano silver treated samples were evaluated for SEM with EDS, TGA, FTIR, K/S value and antibacterial activity (AATCC 100).

Energy Dispersive X-ray Analysis (EDX) technique with Scanning Electron Microscopy (SEM) is used for quantifying the amount of elements (metal, oxygen, carbon) on the surface of fiber. From SEM with EDX study, the presence of silver nanoparticle on the surface of the jute fiber was confirmed. The atomic percentage of nanosilver on the surface of the jute fiber is ranged from 0.99 (control) to 5.01% (NaOH treated jute fiber). The peaks observed between 2 kV and 4 kV are directly related to the silver characteristic lines K and L (Figure 1b). The maximum located on the left part of the spectrum at 0.2 kV clearly comes



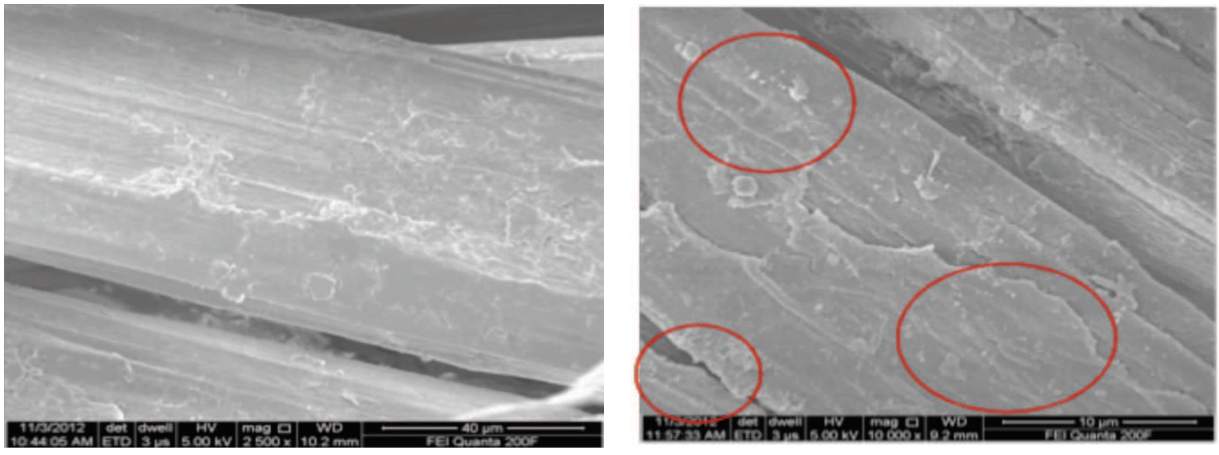
1a.Untreated jute fiber



1b. Nano silver synthesized on NaOH treated jute fiber

from carbon. The hardly visible maximum located at 0.5 keV is connected with the oxygen characteristic line. It is assumed that treating with NaOH results in formation of soda cellulose (Cell.O-Na+), which possess higher Ag+ adsorption & therefore higher possibility to create oxygen-silver bonds i.e. in-situ synthesis of nanosilver.

The formation of silver nanoparticle was also confirmed by the SEM photograph. The SEM photograph (10,000 magnification) clearly shows the tiny nanosilver on the surface of the jute fiber. It indicated that jute fiber has potential to reduce silver ion into silver nanoparticle in the range of 182-272 nm on its surface due to presence of reducing group of cellulose. By manual calculation from SEM photograph, it is observed that alcoholic NaOH and NaOH pretreated (182-212 nm) jute fiber has more Ag nanoparticle than other pretreatments (208-272nm) due to formation of sodium cellulose.



2a: Untreated jute fiber *2b: Nano silver synthesized on NaOH treated jute fiber*

Figure 2 : SEM photograph of untreated and nanosilver applied jute fiber

Pretreatment on jute fiber has also influence on the final size of Ag nano particle which could change the final colour of jute fiber, since it removes part of hemicelluloses and formation of reducing groups of cellulose (Figure 4). FTIR study confirmed the reduction in the amount of hydroxyl groups in silver

Figure 3 : Zone of inhibition of silver nanoparticle applied jute fiber

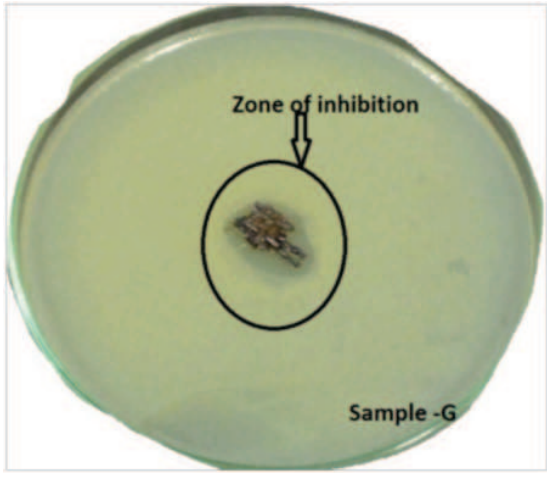


Figure 4 : Colour of in-situ synthesized Ag nanoparticle applied jute fabric

nanoparticle treated jute fiber than control jute fiber. The antibacterial activity of nanosilver applied jute fiber & untreated jute fiber was evaluated as per AATCC standard (Figure 3). All pretreated and nano silver treated jute fiber shown 11.1mm zone of inhibition (better antibacterial activity) than control jute fiber (no activity). It is due to presence positive ion of silver nanoparticle that will destroy the cell membrane complex of the microorganism and so imparting antibacterial activity. From this pre-project work, it is concluded that nanosilver could be in-situ synthesized on jute fiber by prior pretreatment and the nanosilver could gave antibacterial functionality on jute fiber

Synthesis of nanosilver particle by chemical reduction method

From the pre-project results, nano-silver was selected as a suitable nanoparticle for imparting antimicrobial finishing on jute fabrics. Nanosilver was synthesized by chemical reduction method using silver nitrate as precursor, sodium borohydride as reducing agent and sodium citrate as stabilizing agent.

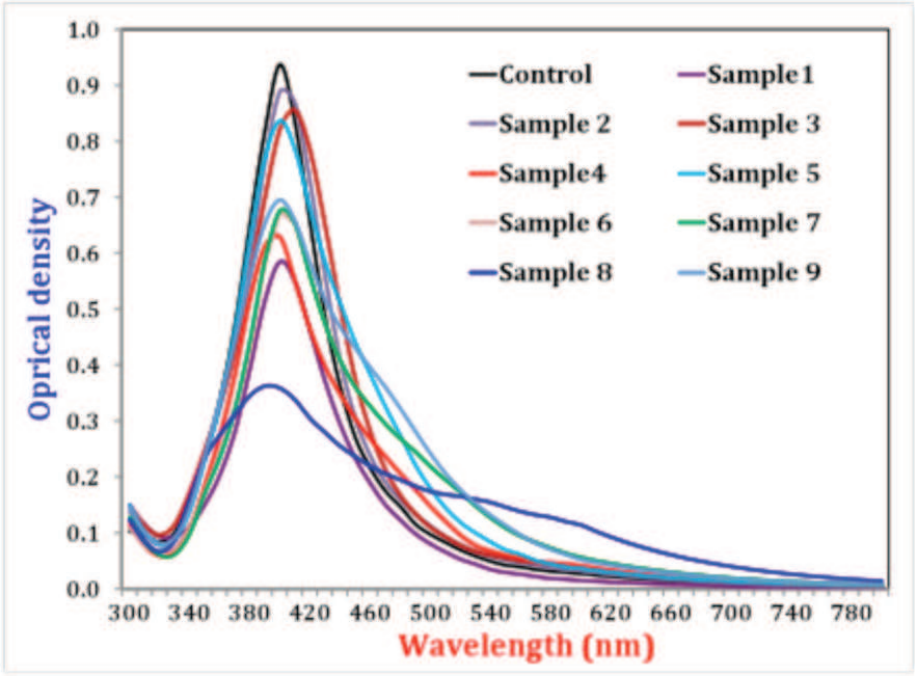


Figure 5: UV Spectroscopy of nanosilver colloidal solution at 300 to 800 nm wavelength

To optimize the preparation method, an orthogonal matrix array was used in which the dependent variable are concentration of sodium borohydride (1,5 & 10 mM), concentration of sodium citrate (0.25, 0.50 & 1 mM) and time (30, 60 & 120 minutes) with three ranges and kept the concentration of silver nitrate as 1mM (9 experimental methods using orthogonal array). After preparation, the nano-silver was applied to jute fabric by an exhaustion method for 60 minutes/ 90°C/ 1:20 MLR followed by gentle washing and drying at ambient condition. The performance properties such UV-VIS spectroscopy of nanosilver solution and K/S value of nano silver applied jute fabric were evaluated.

From the UV-spectroscopy (Figure 5), it is observed that, the λ_{max} of the synthesized nanosilver was in 400nm which is matched with the literature data. It also confirmed the formation of nanosilver from the given condition (except in sample 8 may be due to aggregation of nanosilver). The distinctive colors of colloidal gold and silver are due to a phenomenon known as plasmon absorbance. Incident light creates oscillations in conduction electrons on the surface of the silver nanoparticles and electromagnetic radiation

is absorbed. The colour of the all nanosilver colloidal solution is varied from light golden yellow to golden yellow which may be due to size distribution of nano silver.

The chemical reaction is the sodium borohydride reduction of silver nitrate is given below and sodium citrate is stabilizing the nanosilver. Literature survey inferred that this method produces 12±2 nm particles and the plasmon absorbance is near 400 nm, which is confirmed by spectroscopy.

$$AgNO_3 + NaBH_4 \ddagger Ag + {}^1/_2H_2 + {}^1/_2B_2H_6 + NaNO_3$$

The K/S value of the different nano silver applied jute fabric is tabulated in the Table 1. It is inferred that, the K/S value of all samples is ranged between 3.87 and 5.71 in which the maximum and minimum value are observed in sample 8 & 1 respectively. The colour difference (AE) with respect to control sample is higher in sample 1, 2 & 3 (8.23-10.62) than other samples (< 3.16). The colour of the nano silver applied fiber mainly depends on the surface plasmon resonance, crystal structure, aggregation and kinetics of nanosilver. It is observed that K/S value of samples 4, 5,6,7,8 & 9 has less deviated from the control sample and the variation in the K/S values may be due to size of nanosilver.

Table 1 : Experimental plan for synthesis of nanosilver and K/S value of nano silver applied jute fabric

Sample No	$NaBH_4$ (mM)	Trisodium citrate (mM)	Time (min)	K/S at 420nm	AE
Control	10	1	120	5.67	--
1	1	0.25	30	3.87	8.23
2	1	0.50	60	3.83	8.98
3	1	1.00	120	4.83	10.62
4	5	0.25	60	4.98	2.55
5	5	0.50	30	5.70	3.14
6	5	1.00	120	5.47	1.03
7	10	0.25	120	4.78	2.08
8	10	0.50	30	5.71	3.16
9	10	1.00	60	5.68	2.52

The presence of silver nanoparticle on the surface of the jute fiber was confirmed by SEM (Figure 6).

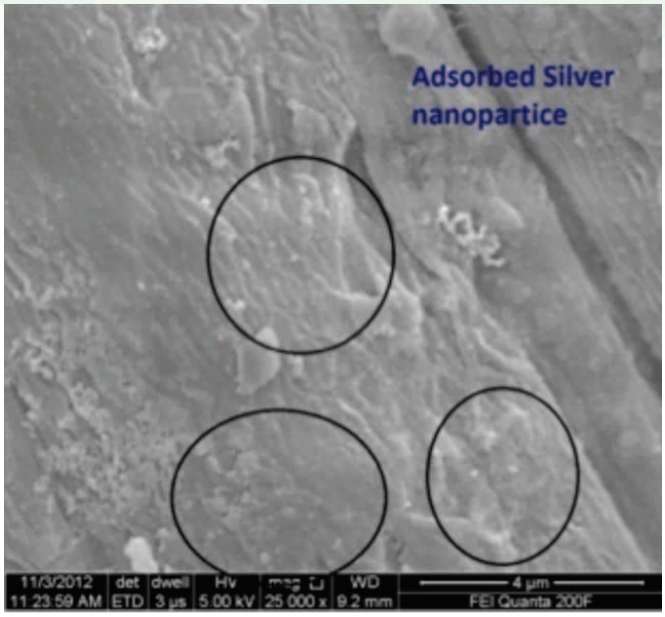


Figure 6 : SEM of nano silver applied jute fiber

Transfer of Technology Division

Achievement

- Based on the trial run of existing Pineapple leaf fibre extractor, a new extractor for up-scaling the capacity has been designed and developed.
- Software has been developed to capture and process fabric image files and conversion of image file to binary. Programme has also been developed for pre-processing of fabric image like contrast adjustment, intensity adjustment, histogram equalization and morphological reconstruction.
- Jute production system as a whole was assessed for the environmental consequences. Amount of N,P and K were estimated from fibre, sticks and leaves as percentage of total dry weights of products.
- Base line survey was conducted in respect of socio-economic and bio-physical parameters in the Bhangar blocks of South 24 Parganas district of West Bengal to explore the scope of NIRJAFT to extend help in agrotextile aspect. It was found that there were lots of scopes of application of agro-textiles in large scale vegetable growing areas. Agro-textile mulches of three different thicknesses of 250, 300 and 350 gsm along rice straw were laid in the field and soil health was assessed in the tomato growing plots.
- A six day training programme on SAS software was organised for Scientist and technical staff members of NIRJAFT and CRIJAF. Twenty four in house seminars on different R&D activities of NIRJAFT, nine training programmeson different NIRJAFT technologies were organised during the period. Participation has been made in seven different exhibitions to showcase different NIRJAFT technologies.

TOT-2 Analysis of information dissemination techniques in transfer of jute and allied fiber technology through training, exhibitions and demonstration for rural development

Dr. U. Sen, Dr. S. B. Roy, Sh. S. Das and Sh. K. Mitra

NIRJAFT organized a training program on Jute bag and Jute chappal for 20 participants of SC/ST category from Aila affected areas of North 24 Parganas district in West Bengal. The objective of the training program was to demonstrate and encourage trainees on starting income generating activities using jute. Out of 20 participants, 12 were male and 8 were female. The training was sponsored by ONGC Ltd. Kolkata.

The participants were given structured questionnaires pertaining to this training program before and after the training program. The results were analyzed by using 1 Parameter Logistic Item Response theory. This model has been implemented by writing a Python script for getting the results.

The questionnaire set that was provided to the participants before the commencement of the training program had few questions related to their socio-economic profile. They revealed that among 12 males in the program, 92% of males and 75% of females had agricultural and associated occupations. While the males hailed from nuclear or small family setups (~58% with family size below 6 members while rest 42% with 6-8 member families), the females belonged to marginally larger sized family (~63% from 6-8 member families). The male participants had mode educational qualifications upto graduate level (~42%) while in the case of female participants, the mode educational qualification was upto secondary level.

The questions in the structured questionnaire (before and after) were treated as items, and thus the scores of the participants were given as input seeds to the aforementioned program as estimates for ability. After this analysis, based on the 1 PL IRT (see Fig.1 and Fig. 2):

$$Pcorrect = \frac{1}{(1 + e^{-(b - \theta)})}$$

where, *Pcorrect* is the probability of correctly answering an item by the participant, b is the difficulty of the item (item parameter) and θ is the knowledge level of the participant, the change in the average knowledge level of the participants were gauged (Table1).

The data showed that the average initial knowledge level of the male participants was higher (by 4%) that of the female participants, as they had greater exposure to some of the technical jargons than the female counterparts due to their higher formal educational training. But, the female participants showed a higher grasping inclination, which was exhibited in their greater knowledge level change (71%). From this study, it was realized that the including the women in the training programs was a success. They alluded at a conducive ambience and effective teaching procedure where the final knowledge level of all the participants were elevated considerably.

Table 1: The average knowledge level of the male and female participants before and after the training

Gender of the participants	No. of participants	No. of items	Average knowledge level (<θ>)	Average knowledge level (<θ>)	Difference in Knowledge level (after-before) (<θ>)
Male	12	15	0.09	0.67	0.58
Female	8	15	0.05	0.76	0.71

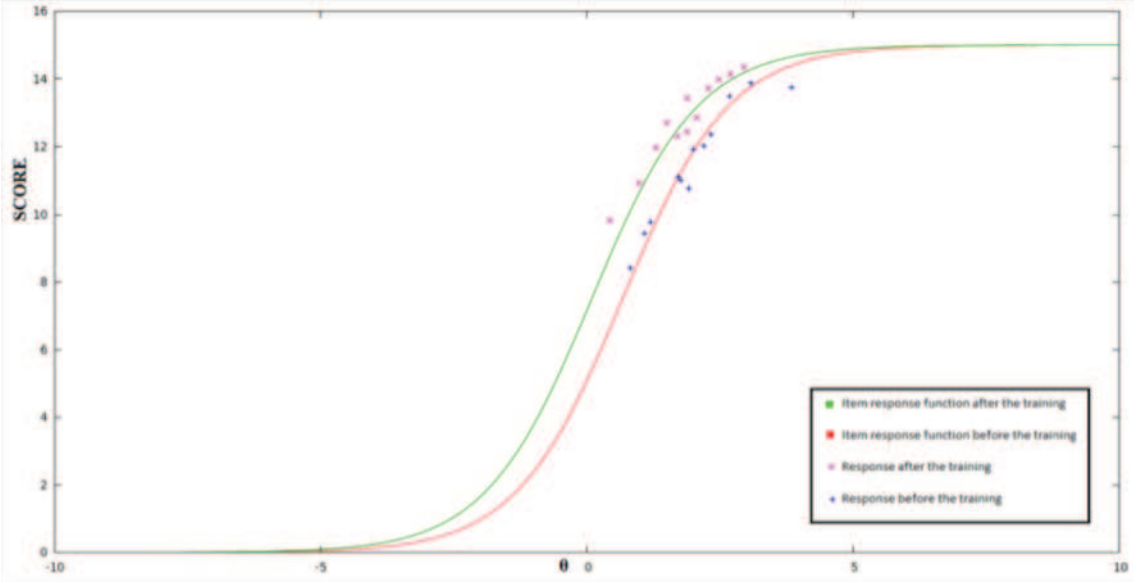


Fig. 1: Item Response Function for males

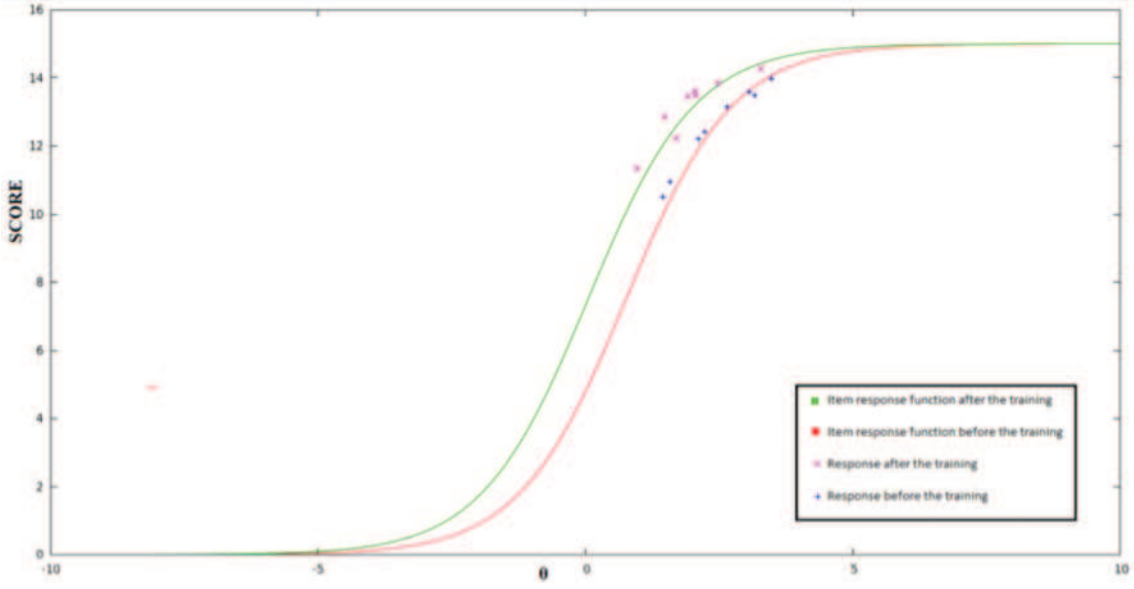


Fig. 2: Item Response Function for females

TOT-4 Environmental impact analysis of jute and jute products in view of carbon balance

Dr. B. Saha & Dr. U. Sen

Jute production system as a whole was assessed for the environmental consequences. Amount of N,P and K were estimated from fibre, sticks and leaves as percentage of total dry weights of products. Percentage of N varied from 0.19% in dry stick to 2.7% in dry leaves. P_2O_5 varied from 0.07% in dry sticks to 0.32% in dry leaves. K_2O varied from 0.68% in dry sticks to 2.26% in dry leaves. The TSS increased during retting and remained stable during post retting stages. Tenacity of jute fibres has been studied for varied environmental conditions like normal, drought and waterlogged conditions. Overall tenacity of fibre was found to be higher in olitorius sp. In case of normal environmental condition, the tenacity varies from 16.5 g/tex (C. capsularis) to 25.0 g/tex (C.olitorius).

TOT-5 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

Banana pseudostem was collected and cut into proper sizes for extraction of fibre through CTRI, Rajamundry developed banana fibre extractor. However, the breakage of fibre was much higher in this machine. The fibre obtained was bleached with hydrogen peroxide to improve its whiteness. Chemical retting of the banana pseudostem through application of Sonali Sathi (7gm/litre of water) was tried (Figure 1 and 2). The retting was completed in 10 days.

Figure 1. Shredded pseudo stem for retting

Figure 2. Retted pseudo stem

Table 1 : Characteristics of machine extracted and retted banana fibre

Category	Strength (gm/tex)	Fineness (tex)
Machine extracted	18.3	7.0
Machine extracted & bleached	10.7	4.0
Chemically retted fibre	16.4	6.5

TOT-6 Design and development of a commercial extractor for PALF

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

Figure 1 : Pineapple Plantation

Pineapple cultivation in India is spread across 92,000 hectares of land and is the sixth largest producer in the world. The major pineapple producing states in India are West Bengal, Assam, Karnataka, Bihar, Tripura and Kerala. Figure 1 shows the pineapple plantation in the state Horticultural Farm, Jalpaiguri, West Bengal. Pineapple leaves are waste materials after harvest of the fruit. Quality textile grade fibre can be extracted either manually or by mechanical process. A trial run was conducted to extract fibre using the extractor designed and developed by NIRJAFT, Kolkata. The trial was conducted at State Horticultural Farm of Govt. of West Bengal located at Jalpaiguri district (Figure 2). After scratching the leaves, retting was conducted at NIRJAFT, Kolkata at a temperature of 25°C. Two bacterial cultures have been developed using enrichment culture technique for quicker retting of the scratched pineapple leaves. It was found that the retting using bacterial culture was faster by two (2) days in comparison to normal retting without culture.

The fibre properties were measured using standard test method and results shown in Table 1.

Figure 2 : Scratching of Pineapple Leaf

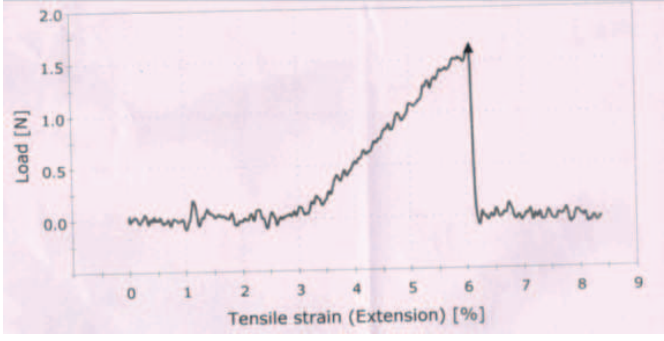
Table1: Properties of pineapple leaf fibre

Sample	Tenacity (gm/tex)	Strain (%)	Fineness (tex)	Maximum Load (N)
E1	30.66 (31.56%)	6.07 (21.88%)	5.50	1.69
E2	30.89 (39.52%)	3.62 (27.11%)	6.50	2.01
C	29.37 (34.61%)	2.79 (23.60%)	4.25	1.25

NB:Value in parentheses () denotes CV value

E1: Enrichment culture 1 E2: Enrichment culture 2 C: Controlled sample

From the table, it is found that control sample, which took more time for retting resulted in improved fineness but the strength was reduced. The results indicate that, the amount of culture, incubation temperature and time of exposure to the microbial culture need to be optimized to get better performance of the microbial culture for extraction of fibre.



The load vs. tensile strain for all the samples is given in Figure 3 to 5.

Figure 3. Stress Strain curve for Enrichment culture 1

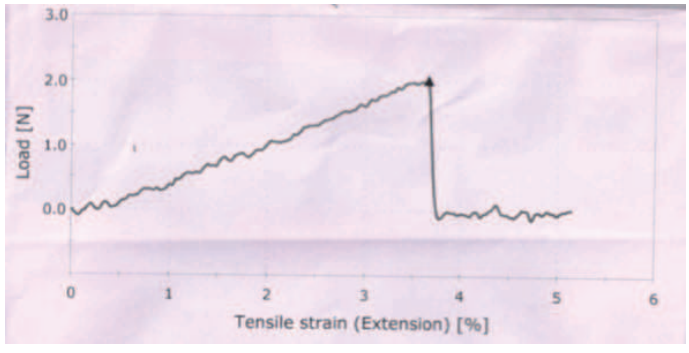


Figure 4 : Stress Strain curve for Enrichment culture 2

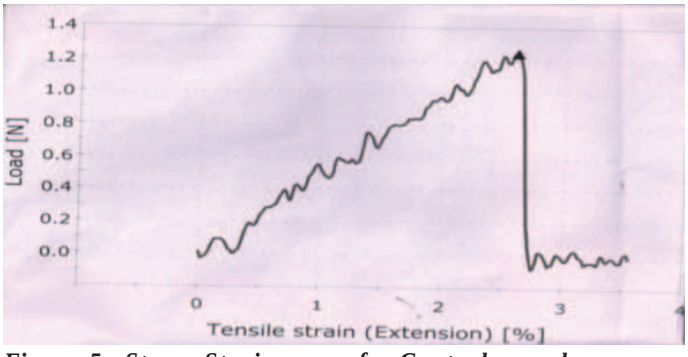


Figure 5 : Stress Strain curve for Control sample

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

Dr. S. B. Roy

Jute constitutes a low proportion of the value of world trade, but its cultivation and processing is labour-intensive and therefore provides livelihood and an important source of food security for many farmers and their families in India. Diversified jute products, such as geo-textiles, floor coverings, hand & shopping bags, wall hanging and other gift items & decorative fabrics are also manufactured in relatively small 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.

Export performance of JDP

Contribution of JDP export to the all jute goods export from India during the period 2000-01 to 2010-11 is increased from 14 per cent to 26 per cent ranging from Rs. 131.15 crores to 353.44 crores in monetary terms. India's total jute goods exports were Rs.931.71 crores and Rs. 1363.29 crores during the same period. There is about 35 per cent increase in JDP export value during 2010-11 as compared to 2009-10.

Export of Jute from India: JDPs Vs Total Jute Goods

Rs. In Crores

Year	Jute Goods Export								
	JDPs						Total JDPs	Total Jute Goods	Share of JDPs
	Floor Covering	Shopping Bag/ Hand Bag	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	--	1.72	0.40	0.11	292.16	1216.16	24%
2009-10	126.89	98.13	--	2.15	1.76	0.12	229.06	859.46	27%
2010-11	134.24	126.42	--	2.86	2.29	3.00	268.80	1854.15	14%
2011-12	142.01	163.66	--	8.61	1.46	4.10	319.84	2094.96	15%

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

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.

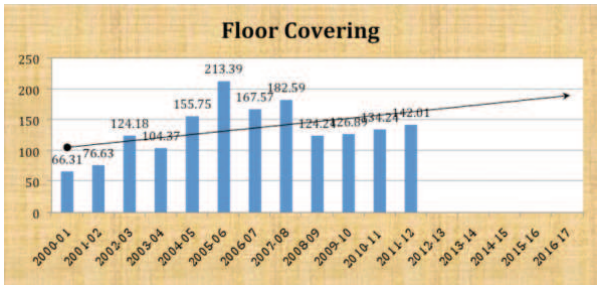


Figure 1

Figure 2

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 (Figure 1,2&4). Whereas other jute diversified products showed decreasing trend indicating the changing preferences of consumers attitudes towards these items (Figure 3&6). And in case of Gift Article it showed constant export performance over the years. However the total JDP export showed desired upward trend and vivid future for the exporters.

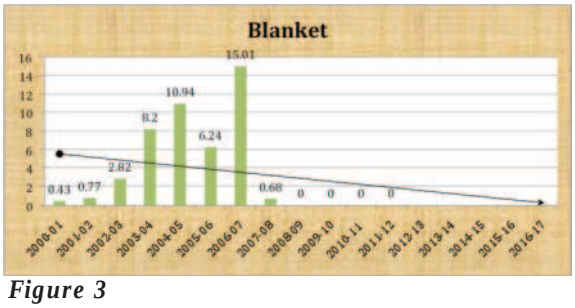


Figure 3

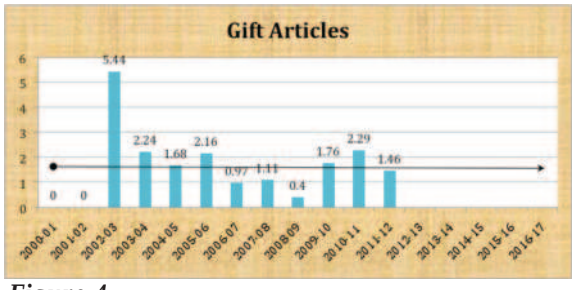


Figure 4

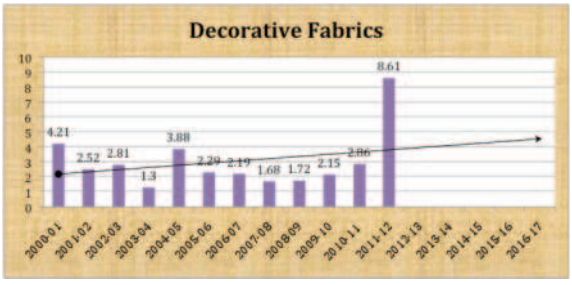


Figure 5

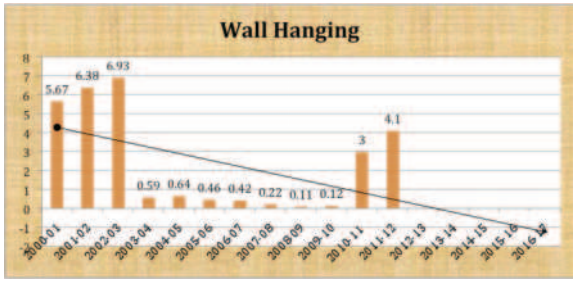


Figure 6

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 2011-12 was over 15%. It is important to note here that export value of jute goods was significantly higher than jute diversified products throughout the time period (Figure-9).

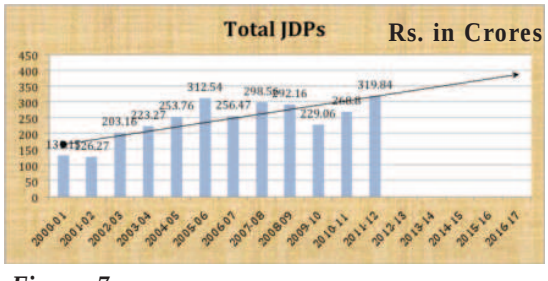


Figure 7

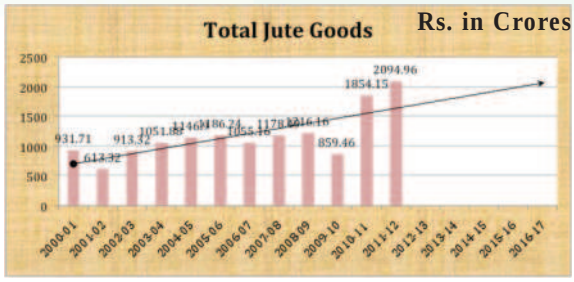


Figure 8

Export of jute diversified products in financial year 2011-12 was Rs. 319.9 crores, which was a notable rise by 143.9 per cent rise in value terms over the corresponding figures of financial year 2000-01 in India. It needs to be pointed out here that the composition of JDP export base has continued to remain same with slight changes in their contributions. India's export basket is concentrated in only about five traditional jute products including yarn and five JDPs.

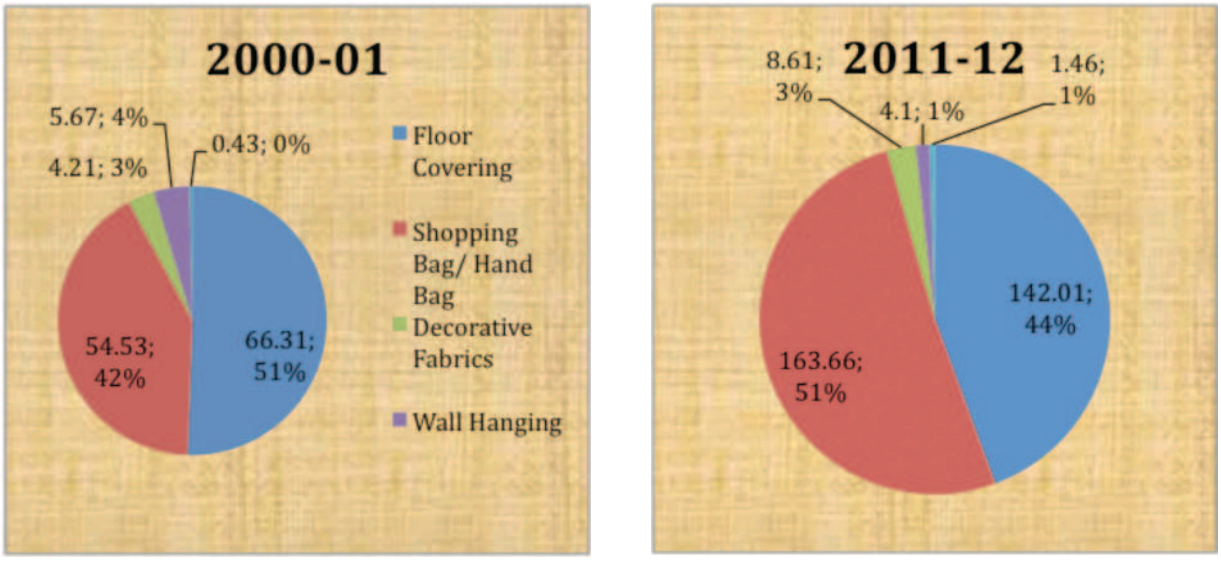


Figure 9 : Share of JDPs Export Items

Figure 9 indicates that, contribution of jute shopping bag/ hand bag has increased from 42 per cent in 2000-01 to 51 per cent in 2011-12 while share of floor covering declined from 51 per cent to 44 per cent during the same period.

The increasing global awareness about the advantage of using natural fibres has now resulted in a rise in global demand for jute goods in view of environmental friendliness of these products. Globally, demand for diversified jute products is growing particularly in developed country markets such as USA, Canada, Australia and Japan, where peoples are becoming increasingly conscious about carbon footprint of consumer goods. India is in a unique situation in jute production to take advantage of this growing consumer concern and the resultant interest in near future.

TOT-8 Development of suitable expert system for analysis of defects of jute fabrics during inspection

Shri S. Das

Texture analysis is an important approach in jute febric quality control. The investment in automated unit is more economical when reduction in labor cost and associated benefits are considered. Preprocessing

in jute fabric image is a crucial initial step before texture analysis is performed. Quality control, designed to ensure that defective products are not allowed to reach the customer. Visual inspection constitutes an important part of quality control in industry. Until recent years, inspection has been heavily relied upon human inspectors. Development of fast and specialized equipment, however, has facilitated the application of image processing algorithms to real-world industrial inspection problems. Since in many areas the quality of a surface is best characterized by its "texture", texture analysis plays an important role in the automated visual inspection of surfaces. The methods followed for inspection are Optical sensor quality, Controlled illumination and Software ability to quickly detect defects. Automatic error detection is performed by a specially design software able to compare in real time the jute febric texture image with the desired pattern of the jute febric material. Preprocessing methods can dramatically improve the performance of image processing methods like Image transform, Segmentation, Feature extraction and Fault detection. Jute febric industry need, automatic real time quality control in order to avoid end products defects in a quick and efficient manner. Manual control is inefficient, time consuming that leads to heavy material loss. On other hand automatic quality control is much more efficient, because it is real time and independent from manual efficiency. Even good quality cameras are used with an adequate artificial illumination it is necessary to pre-process those images before applying image-processing methods. The different preprocessing techniques like contrast adjustment, intensity adjustment, histogram equalization, binarization and morphological operation is applied.

Need for preprocessing

Image acquisition is a highly important step for the automatic quality control because it provides the input data for the whole process. The acquisition is performed by an optical sensor which is always a video camera (with one line or a matrix of CCD) that provide accurate and noiseless image. Local illumination is directly linked with the quality of image acquisition because it is straight forward to demonstrate that its variations can heavily affect the patterns visibility in the jute febric texture image. Consequently the natural sources of light which are non-constant must not be employed and their influence should be carefully eliminated. Thus the use of a strictly controlled illumination provides control, exclusively by one or more artificial light sources is the reasonable alternative.

Preprocessing Method for Jute fabric texture Images

Preprocessing is the important method that influences automated detection of defects. The following are the preprocessing methods under study

(a) Contrast adjustment

(b) Intensity adjustment

(c) Histogram equalization

(d) Binarization

(e) Morphological operation

Contrast Adjustment

The contrast of an image is the distribution of its dark and light pixels. A low-contrast image exhibits small differences between its light and dark pixel values. The histogram of a low-contrast image is narrow. Since the human eye is sensitive to contrast rather than absolute pixel intensities, a perceptually better image could be obtained by stretching the histogram of an image so that the full dynamic range of the image is filled.

Intensity adjustment

Image enhancement techniques are used to improve an image, where "improve" is sometimes defined objectively (e.g., increase the signal-to-noise ratio), and sometimes subjectively (e.g., make certain features easier to see by modifying the colors or intensities). Intensity adjustment is an image enhancement technique that maps the image intensity values to a new range. The low-contrast image with its histogram and all the values gather in the center of the intensity range.

Histogram equalization

The Histogram Equalization evenly distributes the occurrence of pixel intensities so that the entire range of intensities is considered. This method usually increases the global contrast of images, especially when the usable data of the image is represented by close contrast values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values. Then probability density function (pdf) is calculated for the histogram.

Binarization

Binarization is a model-motivated approach, the image intensity distribution is used to create the binary version of the image. The Expectation-Maximization (EM) algorithm is then used to iteratively solve this. The corresponding binarized images are shown in Figure. The model-based binarization addresses well-known data quality problems such as temporal calibration drift, coupled with spatial variability of sensitivity and illumination.

Morphological Operation

Every texture image taken has been implemented with morphological reconstruction, extended maxima transformation using thresholding, the extended maxima transformation is the regional maxima computation of the corresponding H-maxima transformation. As a result, it produces a binary image. A connected-component labeling operation is performed, in order to evaluate the characteristics and the location of every object. The extended maxima transform computes the regional maxima of the H-Transform. Here H refers to nonnegative scalar. Regional maxima are connected components of pixels with a constant intensity value, and whose external boundary pixels will have a lower value.

Experimental Evaluation

To test the accuracy of preprocessing algorithms, the following steps are used.

- A jute fabric texture image is taken as input.
- Preprocessing algorithm is applied for texture image.

Externally Funded Project

Achievement

- Jute nonwoven fabrics having high strength, low extensibility and improved dimensional stability have been developed. Dense nonwoven fabrics have also been engineered for applications such as prefabricated grassmat, horticultural pot, mulching, medical solid waste disposal etc.
- Equipments and instruments like high capacity power ribboner for jute and mesta plants, electronic microprocessor based integrated grading instrument and computerized instruments for studying bending behavior of fabrics are in advanced stages of development.
- Chemical treatment procedures for juite to improve the strength of jute fabric based polyester resin composites have been developed. A few oligomerss have also been synthesized for treatment of jute fabrics as adhesion promoters in composites.

JTM - MM/IV/7.1/5 Development of low cost dense jute nonwoven fabric

Dr. S. Sengupta, Dr. S. Debnath & Dr. P. K. Ganguly

a) Results and outcome of R&D activities.

(i) Improved strength: Generally strength of nonwoven fabric is low. But judicious processing may increase the strength. The achieved strength is more than 2.83 cN/tex

(ii) Breaking strain: Strain should remain under control to get dimensional stability and it can be 20-30% for needle punched and 3-5% for adhesive bonding.

(iii) Improved dimensional stability: Use of adhesive improves the dimentional stability reducing high initial modulus and low extensibility.

(iv) Sectional air permeability (SAP): Air permeability shows the porosity of fabric, Depending on use the SAP may be 25-50 cc/s/cm^2,

(v) Improved fibre shedding: Application of adhesive decreases fibre shedding. It is below 100 mg.m-2.

(vi) To engineer suitable dense jute nonwoven fabric for geo environmental and agricultural purposes.

(a) Statistical relations were developed to predict and design the required fabric for geo environmental and agricultural purposes.

(b) Suitable nonwoven mulching fabric has been engineered for better performance.

(c) Suitable nonwoven fabric for horticultural pot has been engineered.

(d) Suitable nonwoven fabric for prefabricated grass mat has been developed.

(e) Cost of nonwoven fabric has been reduced by using waste jute.

(f) Maximum density achieved in needled fabric is 0.181 g/cc.

(g) Adhesive bonded fabrics with different adhesives and proportions were made to optimize the parameters. Add on, drying and curing temperature were also varied.

(vii) To develop a low cost dense jute nonwoven for medical waste disposal.

(a) An adhesive bonded fabric of 110 g/m2 were developed for medical solid waste disposal.

(b) Cost of nonwoven fabric has been reduced by using short waste jute.

(c) Maximum density achieved the fabric is 0.98 g/cc.

(viii) Testing and standardization of the above products.

(a) Tenacity, Breaking strain, Area density, Dimensional stability, Sectional air permeability, Fibre shedding, Thermal Insulation and bursting strength have been studied.

(b) Standardization has been made for mulching nonwoven cloth from waste jute (400-500 gsm fabric with 200 punches/cm2 and 12 mm depth of needle penetration is used depending on agro-climatic zone).

(c) Standardization has been made for horticultural pot (350 gsm with 180 punches/cm2 and 12 mm depth of needle penetration needled fabric with scrim cloth reinforcement).

(d) Evaluation of adhesive bonded nonwoven was done w.r.t. gsm, strength, elongation and rigidity for standardisation.

(e) Double layer 500 gsm jute waste nonwoven with approx.4 mm soil layer gives the best result for grass mat.

(f) Weed control was also tested and found to be 50-65%.

(ix) Bulk trial and cost viability analysis.

(a) A mulching trial of jute needle punched nonwoven has been conducted at KVK, Gayespur, Nadia on summer tomato and compared with plastic and conventional natural mulches.

(b) A mulching trial of jute needle punched nonwoven has been conducted at CIPHET, Abohar, Punjab on strawberry and compared with plastic.

(c) A horticultural pot trial has been conducted at (1) KVK, Gayespur; (2) KVK, Neempit and (3) Garden hut, Kolkata.

(d) Prefabricated grass mat trial has been conducted with jute needle punched nonwoven at Moharkunja, Kolkata in collaboration with Garden Hut, Kolkata.

Cost benefit analysis for all the products developed under this project has been studied.

(x) Dissemination

(a) S Sengupta attended and discussed in Buyer Seller meet on Agricultural Textiles on 29th March, 2012 at FICCI House, New Delhi organized by Ministry of Textiles in collaboration of FICCI.

(b) A technology transfer/Dissemination Seminar on 'Development of low cost dense jute nonwoven fabric' was organized at W. M. Hall, 1st level, BCCI building, 6, Netaji Subhash Road, Kolkata 700001 on 29th Jan, 2013. About 60 eminent technologists and entrepreneurs of organized and unorganized sector have shown keen interest on manufacturing and utilization of nonwoven fabrics in various value added products.

(c) S. Sengupta, S. Debnath, K Banerjee, S Sikdar, B Ghosh, Jute based nonwoven in technical textiles, presented in All India seminar on 'Innovation and Emerging Trends of Jute, Textile and Garment Products' on 17th & 18th Feb, 2012 at Kolkata organized by Textile Engineering Division, WB State Centre, Institute of Engineers in collaboration with National Jute Board, Ministry of Textiles. Published in Book of papers, Page 24.

(d) S Sengupta, S Debnath, P K Ganguly, Jute nonwoven fabric for eco-friendly uses, Technology Transfer Seminar on 8th & 9th Nov, 2012 at Hotel Stadel, Kolkata organised by National Jute Board, Ministry of Textiles, Govt of India at Kolkata. Published in Book of Abstract, Page 7.

(e) An invited lecture was delivered by S Sengupta on 'Jute in Agriculture' in a seminar on Protective Agrotextiles - Advantages & Future Prospects on 22nd March, 2012 at IJIRA, Kolkata organised by SASMIRA & Office of Textile Commissioner in association with IJIRA and BCKV.

(f) A 22 min DVD has been prepared describing nonwoven fabric preparation and highlighting project findings. It has already shown in two seminars.

(g) Book writing on 'Needle punching and adhesive bonding nonwoven' has been 70% completed.

(h) A model on 'Jute nonwoven in agriculture' has been made and displayed in the NIRJAFT nonwoven.

(i) A folder on 'Nonwoven from jute' has been prepared.

(j) Writing for two patents on 'Jute nonwoven in agriculture' and 'low gsm well covered fabric from jute' are going on.

Prototypes developed

Till date, following prototypes has been developed and bulk trial has been conducted:

(1) Mulching Fabric : 300 g/m2 fabric with 200 punches/cm2 and 12 mm depth of needle penetration is suitable for strawberry cultivation in semi-arid zone whereas 500 g/m2 fabric with 180 punches/cm2 and 12 mm depth of needle penetration is suitable in summer variety tomato at west Bengal.

(2) Weed suppression: Mulching with jute nonwoven with above parameters helps in weed control also. Almost 60% weed has been reduced in mulching.

(3) Fabric for medical solid waste disposal: 110 g/m2 adhesive bonded fabric has been developed for solid waste disposal bag.

(4) Horticultural pot: 300 g/m2 scrim cloth reinforced fabic can be used as horticultural pot.

(5) Prefabricated grass mat: 500 g/m2 jute scrim cloth reinforced waste jute needle punched nonwoven fabic can be used in formation of prefabricated grass mat.

(6) Light weight adhesive bonded bag: An adhesive bonded fabric of 110 g/m2 has been developed to make light weight carry bag which can be used as dry solid waste disposable bag.

h) Product / process standardization.

(a) Tenacity, Breaking strain, Area density, Dimensional stability, Sectional air permeability, Fibre shedding, Thermal Insulation and bursting strength have been studied.

(b) Standardization has been made for mulching nonwoven cloth from waste jute (400-500 gsm fabric with 200 punches/cm2 and 12 mm depth of needle penetration is used depending on agro-climatic zone).

(c) Standardization has been made for horticultural pot (350 gsm with 180 punches/cm2 and 12 mm depth of needle penetration needled fabric with scrim cloth reinforcement).

(d) Evaluation of adhesive bonded nonwoven was done w.r.t. gsm, strength, elongation and rigidity for standardisation.

(e) Double layer 500 gsm jute waste nonwoven with approx.4 mm soil layer gives the best result for grass mat.

(f) Weed control was also tested and found to be 50-65%.

i) Report on pilot scale and bulk scale trials.

(a) A mulching trial of jute needle punched nonwoven has been conducted at KVK, Gayespur, Nadia on summer tomato and compared with plastic and conventional natural mulches.

(b) A mulching trial of jute needle punched nonwoven has been conducted at CIPHET, Abohar, Punjab on strawberry and compared with plastic.

(c) A horticultural pot trial has been conducted at (1) KVK, Gayespur; (2) KVK, Neempit and (3) Garden hut, Kolkata.

(d) Prefabricated grass mat trial has been conducted with jute needle punched nonwoven at Moharkunja, Kolkata in collaboration with Garden Hut, Kolkata.

Light weight bag

An adhesive bonded fabric of 110 g/m^2 has been developed to make light weight carry bag which can be used as dry solid waste disposable bag. The bags are under performance testing.

Fig 6 : Light Weight Carry bag

NJB/MM-lV/6.2 Development of electronic and microprocessor based integrated instrumentation for jute grading system

Dr. G. Roy & Dr. S. C. Saha

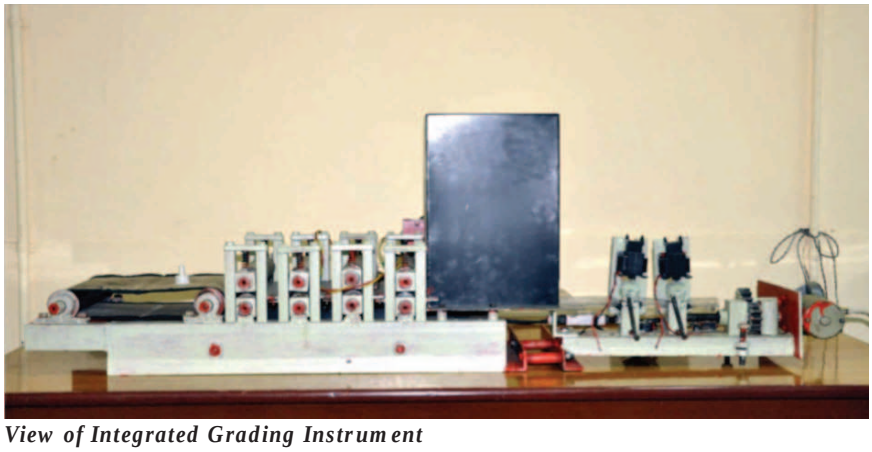
Jute is the second most natural fibre, next to cotton, cultivated in the world. It is extensively grown in India, Bangladesh, Indonesia, China etc. In India, jute is an important commercial crop of eastern region in particular. Jute can be used in many different areas, and has been receiving increasing attention from industry. Their interest not only on the traditional uses of jute, but also on the production of other value added products.

Previously jute grading was location specific i.e., 'Place of origin' was the basic guideline for grading of jute fibre. It was very disadvantageous and inconvenient for the growers to follow such a system of grading. To remove that defective procedure, Bureau of Indian Standards (BIS) introduced scientific grading in 1969 of eight grades with seven parameters. After several revisions the present jute grading system has eight grades considering six physical parameters like, strength, root content, defects, fineness, colour and bulk density. The importance of jute fibre is increasing day by day. The application of fibre in different areas, fibres of different qualities are required. Different score marks are assigned to each character according to its importance. The score marks for different characters, however, vary from one grade to another according to the gradations of characters. This automated grading system is found to be more acceptable and helpful to jute growers.

The proposed automated grading system is an integrated system, consisting of hardware and software units. There are five input units present which will measure the required parameters for grading. All these input parameters will be sent to the Artificial Intelligence unit, which is again software and will work on Fuzzy logic system to behave like a human brain.

A hardware unit is present to measure the strength parameter of jute fibre under test. A hardware/software unit is present to measure the bulk density of the fibre under test. To find the colour in Grey scale, fibre fineness and defects in percentage, the scanned view of the image of the jute sample is analyzed using image processing technique. The root content in percentage to be entered manually when asked for.

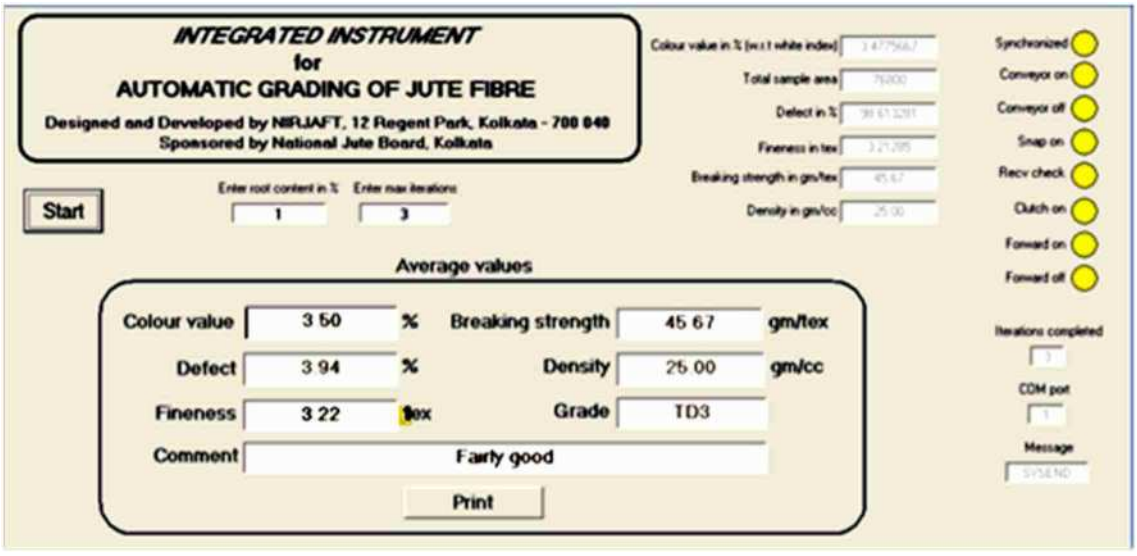
All these parameters will be entered automatically to a software unit from which the fibre grade will be determined and display the exact grade of the jute sample under test using Artificial Intelligence System.



View of Integrated Grading Instrument

Present Status

- Synchronization is going on between different organs of the instrument.
- For strength detection slippage is occurring in the robotics unit
- Sometime fibre is not passing through the robotics unit
- If the jute sample is more in the bed than roller is not working properly.
- Testing is going on to check the instrument



Screen View of the result

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

Study of bending behaviour

- Electro-mechanical rigidity tester has been developed.
- Measures have been taken to reduce the noise and vibration of the mechanical system of rigidity tester.
- Gearing has been modified to get the required speed of testing.
- Principle of test adopted: the load required to bend the fabric of specified dimension in specified deflection. Higher the load, higher will be rigidity.
- The same sample has been tested fifteen times and it was found that difference between minimum and maximum value is insignificant at 1% confidence level.
- 150 g/m^2 jute blended woven fabric, 120 g/m^2 hand knitted fabric, 250, 500, 850 g/m^2 jute needle

punched nonwoven have been prepared as samples. 630 g/m^2 Dense jute hessian, 150 g/m^2 Laminated jute fabric, 700 g/m^2 Canvas cloth have been procured from market.

- The testing process including size of sample, mounting of sample, speed of test have been optimized.
- Nonwovens, Hessian, Canvas, Knitted, Woven and coated fabric has been tested in the developed tester.
- A graphical user interface (GUI) has been designed for data acquisition and reporting.

Photograph of rigidity tester

Effect of size of sample, mounting of sample, speed of test

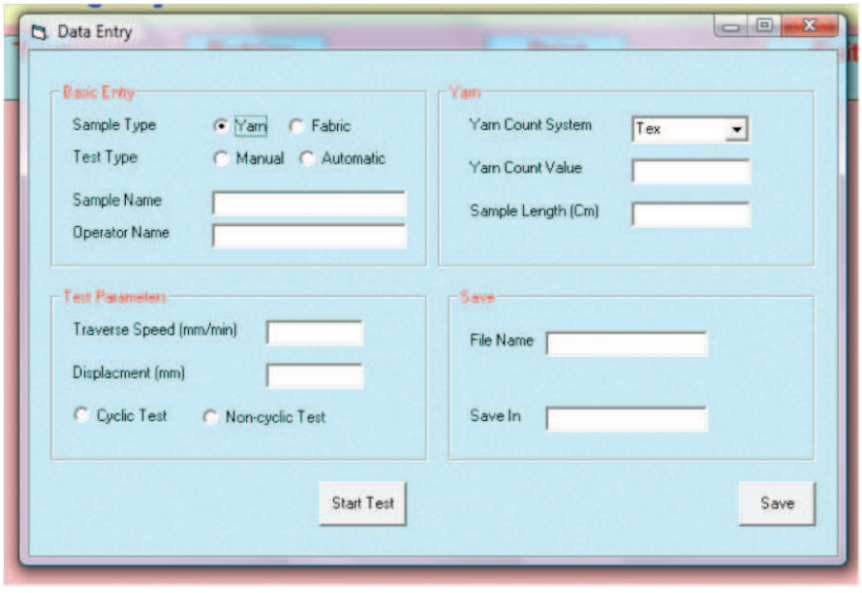
Sample	Direction	g/m^2	Sample width, cm	Sample length, cm	Testing speed, cm/min	Deflection, cm	Load, g
Jute nonwoven	M/c	500	5	25	1	1.5	41
Jute nonwoven	M/c	500	5	25	3	1.5	41
Jute nonwoven	M/c	500	5	25	5	1.5	43
Jute nonwoven	M/c	500	2	25	5	1.5	44
Jute nonwoven	M/c	500	8	25	5	1.5	43
Jute nonwoven	M/c	500	5	20	5	1.5	49
Jute nonwoven	M/c	500	5	30	5	1.5	39
Jute nonwoven	M/c	500	5	25	5	1.0	32
Jute nonwoven	M/c	500	5	25	5	2.0	51
Jute nonwoven: end to end mount	M/c	500	5	25	5	1.5	42
Jute nonwoven: one above another mount	M/c	500	5	25	5	1.5	43

Table : Flexural Rigidity of different jute fabrics, Deflection 1.5 cm, sample width 5 cm, length 25 cm

Sample	Direction	g/m^2	Load, g
Jute nonwoven	M/c	250	25
Jute nonwoven	Cross	250	37
Jute nonwoven	M/c	500	43
Jute nonwoven	Cross	500	51
Jute nonwoven (Rev side)	M/c	500	42
Jute nonwoven	M/c	850	82
Jute nonwoven	Cross	850	88
Hessian	Warp	630	65
Hessian	Weft	630	47
Canvas	Warp	850	117
Canvas	Weft	850	67
Knitted	course	120	10
Knitted	Wale	120	8
Blended Woven	Warp	150	18
Blended Woven	Weft	150	12
Laminated jute fabric	Warp	150	25
Laminated jute fabric	Weft	150	20

GUI Design

Data Entry (Yarn)



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 & Dr. S. Sengupta

In the recent past the yarn characterization has been done by using the capacitive sensors and the optical sensors. For the capacitive sensors the dielectric constant of the capacitor changes with respect to the humidity. Hence the yarn characterization has to be done in the controlled environment. These drawbacks made us to think about the image processing of the yarn which is surely not affected by the environment. A low cost web camera is used for fetching the picture of the yarn. The instrument developed in such a way that the outcome of the yarn characterisation are performed similar to that of USTER. The hardware that has been developed is shown in the figure below.

The camera has the high quality CMOS sensor with the resolution of 12 megapixels and has 5G wide-angle lens. It also incorporates 6 LEDs with brightness controller and has the lens that can be focused from 5cm to infinity. In order to obtain higher contrasts for the yarn geometry relief, the illuminated yarn surface must be as close as possible to the light source.

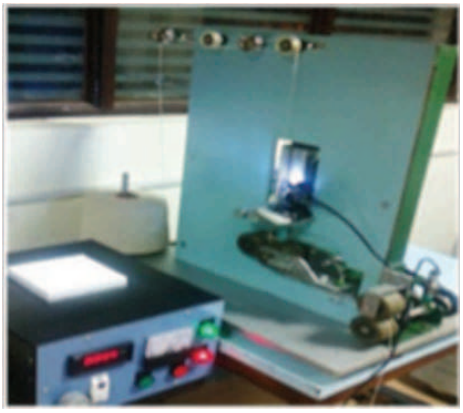


Figure 1 : System as a whole

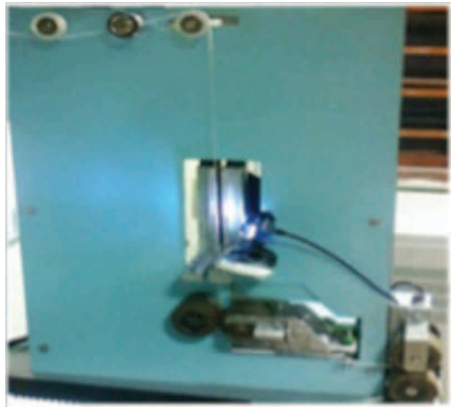


Figure 2 : Image Acquisition Figure

Four pulleys have been used for fetching the yarn from the creel stand where the yarn is kept.

A motor with a gear box have been used to drag the yarn and the speed of the motor can be controlled which has also an indicator from showing the speed of the motor which concludes how much yarn is being dragged by the motor in an exact speed which is shown in Figure 1.Figure 2.shows the placement of the camera from where the picture of the moving yarn is being captured and being processed. The image of the moving yarn has been fetched and being processed so as to get the diameter variation along with the thick and the thin places and also the number of the hairs present in the yarn at a specific distance. The front panel shows the processed image which includes the variation of the diameter and shows the total number of thick and thin place and also the total count of the hairs. A LED has been used here which glows when the average diameter is being computed and it starts to give the variation of the instantaneous

diameter over the average diameter indicating how the diameter varies. The computed average diameter is shown on the front panel. A threshold value has been fixed with respect to the average diameter such that the thick places and the thin places can be computed using the conditional statement. The number of the thick/ thin palaces is being counted using a counter. The data of the diameter variation is being shown in the front panel. The yarn has been divided horizontally into upper half and lower half and then the number of the hair count has been done from core of the yarn to a specific distance and the total count has been stored using a counter.

NFBSFARA: FQ-3029 Jute based biocomposites for industry

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

Achievements of the project:

(i) **Chemical modification of jute fabric with dilute sodium hydroxide solution :**

Surface properties of jute play very important role in developing good adhesion between the jute fibres and polymeric resin used for making composites. A good adhesion between them ensures realization of jute's strength and modulus by the composite. Jute's surface is rich in hydroxyl groups due to presence of polysaccharides such as cellulose and hemicellulose which make it hydrophilic and non-compatible with matrix forming hydrophobic resins. Additionally, surface of jute also contains about 1.0% natural fat and wax and about 1.5% jute batching oil applied as emulsion during processing of jute into textile structures being used for making composites. These materials need to be removed from the fibre surface for efficient adhesion between fibre and polymers.

Our earlier work has shown that treatment of jute fabric (commercial) with 1% sodium hydroxide solution at a jute fabric to liquor ratio of 1:10 at ambient temperature (30°C) improves the strength of the composite (Jute-polyester resin) significantly. However, this process involves use of 10% by weight of NaOH with respect to the weight of jute fabric and is considered to be costly and our major purpose is to modify the surface of the fibre without affecting it internally.

In view of this it was decided to study the effect of dilute sodium hydroxide solutions (1% to 6% on fabric weight) on jute fabric properties and to optimize the treatment process. In order to do this, the following parameters have been varied :

(1) NaOH concentration on weight of fabric (1%, 2%, 3%, 4%, 5% &6%)

(2) Time (30 min, 60 min, 90 min, 120 min & 180 min)

(3) Temperature (30°C, 40°C, 50°C, 60°C & 70°C)

(4) Material weight (Jute fabric) : Treatment volume ratio (Liquor) (1:4, 1:10 & 1:15)

From the results it is apparent that tenacity (strength) values of jute fabrics were not affected adversely by treatment with alkali at different treatment conditions. A low liquor ratio is always desirable because it generates less effluent. Weight loss on alkali treatment varied between 1.77% to 3.56% on treatment

with different concentrations (1% to 6% weight) of NaOH solution. Weight loss on alkali treatment appears to follow an increasing trend with increase in liquor ratio of treatment. FTIR spectroscopy of 1% alkali treated jute fabric indicates partial removal of hemicellulose (1733cm-1, drastic reduction of peak) and lignin (1506 cm-1, reduction of peak) (Fig. 1).

Differential Scanning Calorimetry (DSC) and Thermal Gravimetric Analysis (TGA) of treated fibres indicate very little change in jute's structure but for removal of some hemicellulose.

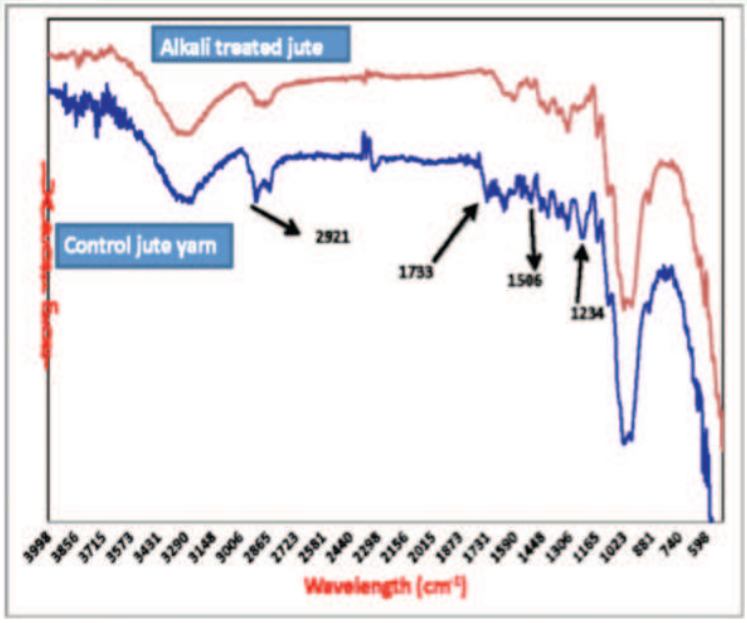


Figure 1: FTIR of untreated and NaOH treated (1% NaOH/30°C/1:10/60 minutes) jute

Scanning electron microscopy of untreated and treated fibres indicate cleaning of fibre surface as well as splitting of fibres thereby increasing the average Length (l) / Diameter (d) ratio of the fibres which favours better reinforcement (Fig. 2).

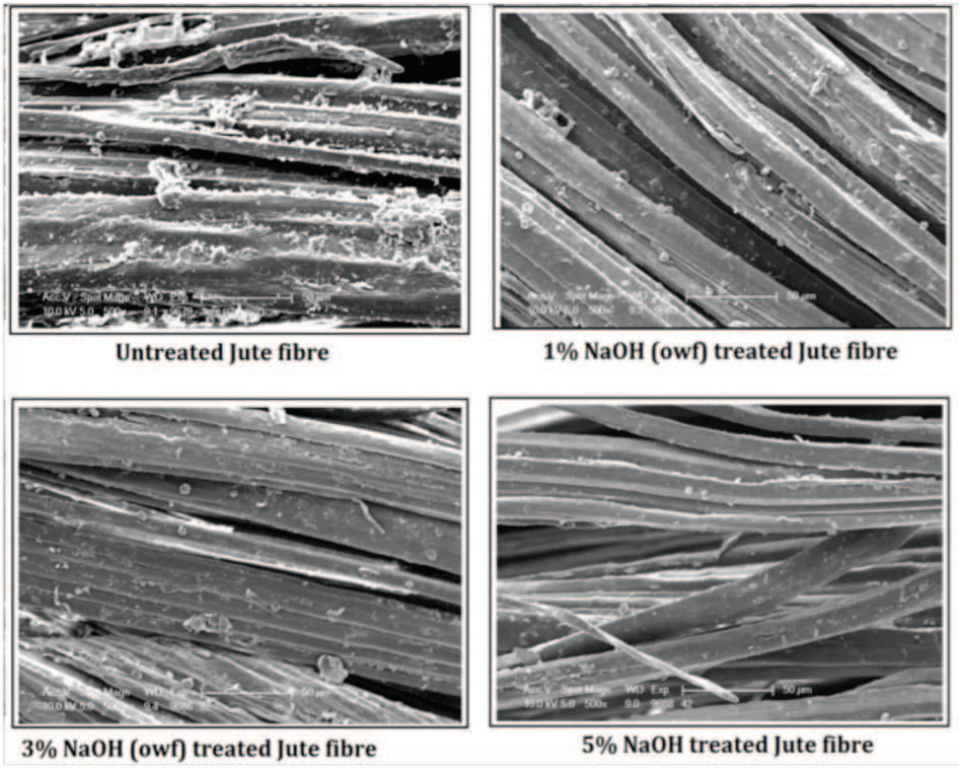


Figure 2 : SEM photograph of untreated and NaOH treated jute fiber (500X)

The best treatment condition would be finalized only after evaluation of the composites obtained from differently treated samples.

(ii) **Oxidation of jute fabric by hydrogen peroxide :**

Jute fabrics were subjected to oxidation treatment with alkaline hydrogen peroxide solution of different strength (1% - 4%) on weight of fabric following standard conditions. The fabrics obtained after neutralization, washing and air-drying were tested for their tensile properties. It is observed that there is a general loss of tensile strength and modulus of jute fabric on oxidation with hydrogen peroxide solution. Loss of weight is to the tune of 3.0% to 5.8% and is proportional to the concentration of hydrogen peroxide used for treatment. The oxidised jute is to be characterized by FTIR, SEM, X-Ray etc.

(iii) **Physical modification of jute fabric by heat treatment :**

Jute fabric has been subjected to heat treatments at 120°C, 130°C, 140°C and 150°C in a hot air oven for 120 minutes each and their moisture content and mechanical properties were determined. It has been observed that with increase in heat treatment temperature strength and modulus values follow an increasing trend. The fabrics are being characterized.

Modification of polymer matrix :

Modification of commercial Unsaturated Polyester Resin (USPR) being used for making composite laminates were attempted. The purpose of the modification was to lower its viscosity and to improve its flow through the jute fabric so that wetting of the reinforcing fabric by the resin was more efficient so that less voids are formed in the composite. Lowering of matrix resin viscosity has been achieved by blending with a resin having lower molecular weight and consequently lower viscosity. Composites have been prepared using the modified resin and are to be evaluated.

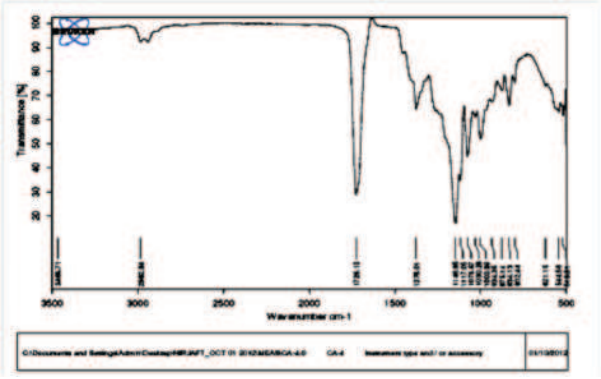
(iv) Incorporation of inorganic nano particles in reinforcing material (Jute Fabric) :

This work is at the stage of initiation. Attempts are being made to identify nano particles suitable for generation in the jute fabric and chemically treated jute fabrics. Oxides of copper and silicon have been identified for trial in the next phase. An attempt has been made to form silver nano particle in jute fabric utilizing jute's reducing nature. Composite laminates have been prepared using that fabric and USPR. The laminate formation required lesser resin and the laminates look very uniform. Its mechanical properties are yet to be evaluated.

(v) Synthesis of low molecular weight oligomers for modification of jute reinforcing fabric :

Low molecular weight polyester oligomers (six in number) have been synthesized reacting moderate chain fatty acids and glycols at a particular molar ratio under reflux. The synthesized materials were soluble in acetone. FTIR spectra (Fig. 3) of these compounds showed strong peaks at 1710cm^{-1} due to ester formation. Solution of such compounds in acetone (0.5% w/v) was used to treat jute fabric samples, followed by drying in air and curing at 110°C for 2 hours. The treated fabrics would be evaluated for strength, morphology and other properties. A few composite laminates have been prepared based on them and are being characterized.

IR SPECTRA of CA-4



IR SPECTRA of CA-8

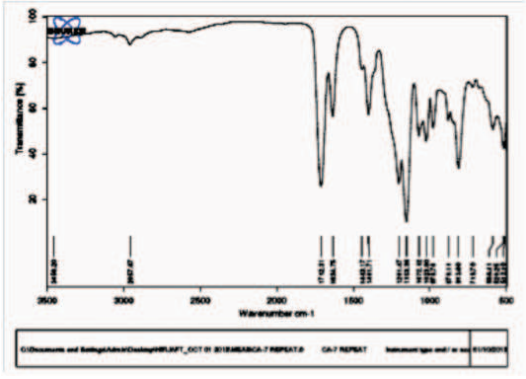


Figure 3 : FTIR Spectra

(vi) Bio-composites using treated jute and their characterization :

(a) Jute reinforcing fabric was treated with lac solutions in methanol and in 1% sodium hydroxide solution. Lac uptake, located predominantly on the fibre surface, was 2% to 6% in three different jute fabrics. Composites prepared out of these fabrics exhibited better strength and modulus compared to composites based on untreated fabric.

(b) Among the composite based on 1% sodium hydroxide treated fabrics at 30°C, 40°C and 50°C at liquor ratios of 1:4, 1:10 & 1:15 for 60 minutes, the composite based on fabrics treated at 40°C and 1:4 liquor ratio exhibited best flexural strength and modulus.

(c) Among the composites based on 1%, 2%, 3% and 4% alkaline H_2O_2 oxidised jute fabrics, the one based on 3% H_2O_2 treated fabric exhibited the best strength and modulus. This was also the highest among all the treatments.

(vii) Jute yarns suitable for making reinforcing fabrics :

Jute yarns were spun with twist levels of 3, 4 and 5 twists / inch (tpi) from a selected batch of jute fibre at NIRJAFT. Variation of twist level of the yarn varies the orientation of the jute fibre in the fabric as well as in the composites. About 25 kg of such yarns (3 twist levels) were sent to CIRCOT for optimizing the technology of preparing polypropylene covered jute yarn using DREF i.e., friction spinning technology. This has been largely achieved and mechanical properties of the yarns produced have also been determined and have been found to be suitable for weaving. Properties of yarns are shown in. A handloom, suitable for weaving jute fabrics, has been fabricated at NIRJAFT.

(viii) Characterized and modified biopolymers from lac:

Lac being used for the work has been characterized and eight formulations based on lac and modified lac have been prepared for use as matrix of jute based composites. Out of these, four formulations were based on solvent while the other four samples were based on aqueous medium. Lac was

modified through formation of lac-urea, lac-thiourea and lac maleic anhydride. Solid content of the lac formulation varied from 25% to 50%. Effect of treatment time (3 to 10 min) on resin uptake by jute fabric has been studied.

NFBSFARA: FQ-3030: Understanding genetics and biosynthesis of gum in ramie (*Boehmeria nivea L. Gaud.*) for developing low-gum genotypes

Dr. P. Satya and Dr. D. P. Ray

Ramie (Boehmeria nivea, Family Urticaceae) is the finest and strongest bast fibre producing crop. Ramie fibre is prized for white silky lustrous appearance, highest tensile strength among plant fibres (60 g tex -1), very fine fibre (0.8 tex), minimum lignin (0.5%) and high cellulose content (87%). Apart from traditional uses as ropes, twines, threads, fabrics, nets and filter cloths, it is also in high demand in apparel industry as blend with cotton. Although India has great potential to meet domestic demand of ramie fibre and capture export market of Rs. 275 million, its cultivation is limited to pockets of North Eastern states, North Bengal and Uttarakhand owing to non-availability of high yielding cultivars and escalated cost of fibre extraction due to high gum content (20-30%). Little is known about the floral biology, breeding behavior and inheritance of fibre quality traits in Indian ramie germplasm, which are major hindrances to design efficient hybridization-based breeding programmes in this clonally propagated crop. Till date, no hybridization based ramie variety has been developed in India. Therefore, understanding floral biology including nature of cross pollination is of paramount importance to gain basic knowledge on ramie breeding system and to develop high yielding varieties exploiting genetic recombination.

To obtain spinnable quality fibre, removal of sticky gummy substance from fibre is essential. Chemical removal of gum from ramie fibre is a costly, hazardous, quality compromising and technically demanding process which is difficult to adopt by farmers, while microbial degumming is not very effective. The ramie gum is a pectic substance constituting primarily of pectin and xanthan, the chemical forms and biosynthesis processes of which are largely unknown. Insights in genetics and biochemistry of gum biosynthesis could provide major breakthrough for manipulating gum production, understanding interaction of gum and fibre biosynthesis and may help in increasing microbial degumming by selection of appropriate microbes. The chemistry of degumming process and the enzymatic interactions are poorly characterized. A detailed understanding of gum biosynthesis and degradation pathway is thus a basic requirement to formulate a strategic research for reduction in gum content in ramie fibre and increase fibre yield and quality. These studies will also enable us to identify potential target genes for blocking gum biosynthesis and microbial genes responsible for gum degradation providing a platform for expression of these genes in ramie for in-planta reduction of gum content. The National Fund for Basic, Strategic and Frontier Application Research of Agriculture, Indian Council of Agricultural Research has granted a Project on the aforesaid title to enable the gum synthesis at different stages of ramie plant growth. The Central Institute of Research on

Jutte and Allied Fibre is the main centre for the research and the National Institute of Research on Jute and Allied Fibre Technology has endorsed the gum biochemistry and profiling of ramie gum at different states of crop growth.

Collection of decorticated ramie fibre

Decorticated ramie fibre was collected from the main centre of the Project, Central Institute of Research on Jutte and Allied Fibre and the Regional Station like Ramie Research Station at Sarbhog, Assam. The decorticated plants were chopped into pieces for determination of gum content. Prior to determination of gum content, the moisture content of different ramie fibre is to be understood. For this reason moisture determination was done for every sample to know the extact gum content at different species of ramie fibres.

Determination of moisture content in decorticated ramie fibre

The decorticated ramie fibre received from the main centre CRIJAF were subjected to moisture analysis prior to analysis of gum. This is required for obtaining the dry weight of the sample. For this the fibre samples were cut into pieces. Two gram of sample was taken in a small weighing bottle. The sample was oven dried at 1100C for 4 hrs and 30 min. Dry mass of the sample was measured. Mass of empty moisture bottle, moisture bottle with sample and moisture bottle with oven dried sample was noted down and calculated the moisture content in the fibre.

Standardization of methods for determination of gum content in decorticated ramie fibre

The existing method of ramie degumming is mainly based on chemical method in which sodium hydroxide at different concentrations are used to degum the fibre. This method is hazardous and not environment friendly. Still the method is popular due to its degumming potentiality. For our project, in addition to the existing method a few other method have been tried for successful degumming of ramie. The existing method was modified for the better extraction of gum and thereby production of quality ramie fibre.To determine the gum content in the decorticated ramie 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 1% HCl for 30 minutes. The fibre was then washed with distilled water, followed by treatment with 1% NaOH for 1 hour. Washing step was repeated and the sample was treated with 2% and 5% NaOH respectively for 1hour. The 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 into the crucible along with weighing bottle was kept in oven at 110°C for 4 hours 30 minutes and weight was taken. The alkali treated fibre were kept for FT-IR and SEM analysis.

Determination of gum content in different ramie varieties at different moisture level

Ten samples received from the lead centre as detailed below were subjected to gum determination with our modified degumming method. The gum content at the different moisture level has been determined and is being enumerated in the Table 1.

Table 1 : Determination of gum content in different ramie varieties at different moisture level

Ramie Variety	Moisture content (%)	Gum content (%)
R 1410	13.84	21.61
R 1446	24.52	27.69
R 1447	25.56	26.19
R 1424	21.94	23.37
R 1419	22.57	22.92
R 1417	10.93	22.86
R 1418	11.83	27.71
R 1428	10.89	25.31
R 1429	35.46	24.52
R 1449	10.25	23.48

Development of suitable methodology for degumming of ramie

Conventional method of ramie degumming is treatment of decorticated ramie fibre with high concentration of alkali. An alternative method of ramie degumming has been tried in our laboratory and it was found from our experiment that treatment with sodium carbonate gives very good result with minimum effect on the fibre surface. Comparative Gum removal capacity of NaOH and Na_2CO_3 at various concentrations from Ramie (R-1411) has been presented in the Table 2. From table it is clear that the removal of gum through the sodium carbonate method is quite slow and takes little longer. However, SEM studies revelaed that that there is minimum fibre damage through the sodium carbonate treatment than sodium hydroxide.

Table 2 : Effect of NaOH and Na_2CO_3 for ramie degumming

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%

Perusal of data from the above table revealed that at the concentration of 50 g/l the gum removal is maximum. But the SEM study revealed that at higher concentration there is impact on the fibre surface where as at higher concentration of sodium carbonate no impact on the surface.

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.

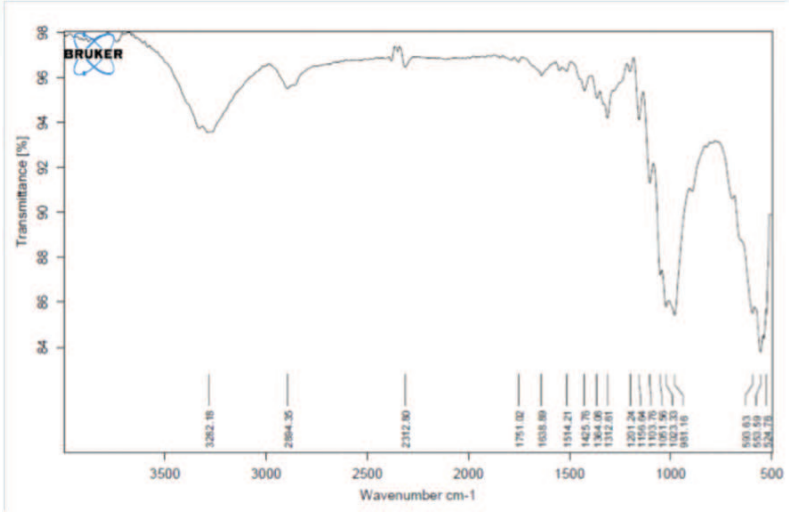


Fig. FT-IR spectra of degummed fibre

NAIP - Component-I:

Zonal technology management and business planning and development (BPD) unit at NIRJAFT, Kolkata

Dr. D. Nag, Dr. A. K. Roy & Dr. S. B. Roy

Salient Achievements/ Innovations:

(a) Signed of MoU with Punrasar Jute Park, Purnea Bihar

India's first Jute Park named Punrasar Jute Park Limited is coming up at Maranga in Purnia district of Bihar at a cost of Rs 600 crore. The seven units Jute Park will mop up Jute from Jute farms in the hinterland of the Kosi region in North-East Bihar for production of Jute Yarn.

The products and finished goods will be marketed across the country. This will check export of jute from the farms in the Kosi belt to Jute Mills in other states.

Business Planning & Development Unit of NIRJAFT has signed MoU with Punrasar Jute Park Limited for value added support services as follows:

1) Capacity Development in Jute Technologies,
2) Detailed Project Report (DPR) Preparation,
3) Technical Support Services,
4) Site visit,
5) Cluster formation
6) Providing Physical Incubation Service.
7) Business Planning & Development Unit of NIRJAFT and Punrasar Jute Park Limited will make a Design Centre for Jute Products at NIRJAFT;

In addition to this, the Business Planning & Development Unit of NIRJAFT has signed MoU with the following Organizations:

- Trishna Jute Private Limited - Jute Stick Particle Board
- Diganta Jute Manufacturing Private Limited - Jute Stick Particle Board
- G M Agro Allied Private Limited - Layered Chicken, Horticulture
- Sudharma Krishi Consultants Private Limited - Formation of Agri Clinic and ICT Application in Agriculture;
- Marg Darshak Development Services - Capacity Development in Jute Diversified Products
- Deb Holding Private Limited - Jute Apparels
- Kalighat Society for Development Facilitation - Jute based Handmade Paper
- Tru Blu International - Designer Jute Bags and Trolleys
- Sabuj Shakti Agro Revolution Pvt Ltd - Production of Vegetables Seeds;
- Silpa Sathi Industrial Consultants Limited- Capacity Development in Jute and Agriculture;

(b) Physical Incubation of Six Companies in Business Incubation Centre

As a part of the Business Support Services to the Clients, the BPD Unit here at NIRJAFT has developed required infrastructure for Technology Commercialization and to provide physical support

to the Entrepreneurs. The BPD Unit has constructed Business Incubation Centre, Pilot Plant facility for Jute Stick Particle Board and Jute based Handmade Paper, Textile Laboratory, Chemistry Laboratory, Training Hall for Entrepreneurs, Conference Room and Meeting Room for Entrepreneurs. The newly constructed Business Incubation Centre was inaugurated on 26th September 2012 by the Hon'ble Director General of ICAR.

At present six Entrepreneurs are under physical incubation of ZTM-BPD. Another four Entrepreneurs has signed Agreement for Office space in the Business Incubation Centre of NIRJAFT.

(A) Inauguration of Business Incubation Centre:

Programme Details:

On September 26th 2012, Dr. S. Ayyappan, Hon'ble Director General of ICAR and Secretary, DARE, Govt. of India inaugurated Business Incubation Centre of ZTM-BPD Unit of NIRJAFT, Kolkata. He went around the centre and discussed with the clients their projects and achievements made so far. Dr. D. Nag, CPI, ZTM-BPD Unit, introduced the clients who have hired office space in the centre to Hon'ble DG. In a brief interaction session with the NIRJAFT staff at the institute auditorium, Dr. Ayyappan discussed all the problems with a positive approach.

In his speech he gave thrust on Commercialization of Technologies and concluded on a note that output oriented research through exploitation of new possibilities of outsourcing is needed to reach a new horizon.

NAIP - Component-II:

A value chain on coconut fibre and its byproducts: manufacture of diversified products of higher value and better marketability to enhance the economic returns of farmers

Dr. G. Basu, Dr. A. N. Roy, Dr. S. Sengupta, Dr. G. Roy, Dr. S. Debnath, Dr. S. K. Chattopadhyay, Dr. K. Rajkumar, Dr. C. J. Thampi & Dr. Satyaraj

Coordination of the project with other Four Consortium Partners (viz., CIRCOT, Mumbai; IRMRA, Thane; Rubber Park and TMNRRDC, Thiruvanatapuram).

One Half-yearly Workshop, one CIC and one CAC Meeting have been organized at ICAR Research Complex, Goa.

A one day "Kishan Mela" farmers training programme was organized, in which several types of end products (textiles and non-textiles), posters showing various applications of coconut fibre were displayed to the 70 number of farmers.

Preparation jute-coir blended yarn and composite fabric in bulk quantity at optimized blend ratio for geotextile use.

Following items were procured

(i) Glass-wares and chemicals

(ii) Coconut fibre

(iii) Jute fibre

Work on optimization of bleaching recipe and dyeing recipe is going on.

Jute-chemically retted coconut fibre blended yarn was spun in bulk to produce yarn for conveyor belting and composite yarns.

Spinning machine has been upgraded.

Annual Progress Reports, Contract Register, SOEs, Proceedings of CIC & CAC Meetings, project extension proposal were prepared and sent to PIU within the stipulated time.

Technology of Prefabricated instantaneous grass carpet has been revalidated on jute-coconut fibre based mat background.

Mr. N Venugopal, a leading industrialist of coconut fibre-based products (M/s Alleppy Co. Ltd, Kerala) appreciated for achievement made on R & D Work including technology of chemical softening of coconut fibre (vide letter (No. Nil, dated 13.04.12).

For grading of coconut fibre, about 30 samples sent from different agro-ecological zones have been tested in the laboratory.

Farmer's Meet

Presentation in Workshop of NAIP - II and Farmer's meet

NAIP, Component - III

Sustainable rural livelihood empowerment project for northern disadvantaged districts of West Bengal

Dr. S. Debnath

During the extension period, the project work has been continued in four clusters as follows. Cluster I: Itahar Block, Cluster II: Dakshin Dinajpur KVK, Cluster III: Uttar Chondipur Block and Cluster IV: Sruti-I Block.

Cluster I - In this cluster 11 rural woman of Sripur Rai SGSY Mahila Dal from Sripur village participated on Training programme which deals with Weaving of jute and cotton based fabric Using Traditional Handloom, and they shows a very keen interest for learning the manufacturing as well as the preparatory process to making of jute based fabric. This training was inaugurated on 26.09.2012 and continued for 17 day and trainees learnt to manufacture some jute-based fabric, locally known as Dhokra, which is quite profitable, and having high demand in local market. They also learnt to produce cotton towel in handloom supplied earlier by NIRJAFT, which also a very demanding in nature and can leads to a steady source of income generation for these rural women.

Cluster II - In this cluster two different training programme has been organized in the premises of Dakshin Dinajpur KVK, Majhian, Patiram, West Bengal. One is extraction of banana fibre from banana agro waste using banana fibre extractor which has already been installed, 15 young progressive farmers participated in this training and they found a complete new experience because value addition of banana plant pseudo stem was never previously introduced to them at all. During the four days (3rd to 6th December, 2012) for training, farmers learned to operate and setting the machine to extract good quality banana fibre. This technology is pretty much appreciated by them as because it is basically value addition of an agricultural waste product.

The second training is related to the value addition of extracted banana fibres and training has been organized on Handicrafts making from jute and banana fibre, a total 15 rural women from three SHG group follows Nari Kalyan SHG, Devi Swanirbhar SHG and Surya Swanirbhar SHG participated in this training. This six days training was collaborately conducted by NIRJFAT & Dakshin Dinajpur KVK and inaugurated on 04.03.2013 and continues up to 09.03.2013. During training period, trainees have been learned efficiently to make different handicraft and model items like Durga face, Ganesh figure, flower vases and door matt etc. from jute-banana fibres. They are very satisfied with their own creation as well as very hopeful because these items have good market potential and provide a good returns. This can create a source of income generation in their leisure time.

Cluster III - Jute is one of the major crops of these region but profitability is very low and farmers continuously loosing there interest in jute farming so one training programme has been organized to overcome this lower profitability fact and 16 interested farmer women from Shankartala, Bhimtala, Kalitala and Pulintala villages selected for training programme on “Model making from fine jute”, for 11 days (11th - 21st December, 2012) and they learned to create jute based handicraft models & Items like Durga face, Bird figure, flower vases and door matt, etc. Women trainees are pleased as this training will open

up a new source of income and local farmers are also happy because they can use a portion of their own cultivated good quality jute for making value added products instead of selling in market.

Cluster IV - Training related to making of Jute handicraft items also delivered to Sruti-I block of Murshidabad for 15 farmer women from Lalupur Village for 10 days during 29.01.2013 to 07.02.2013. The trainees showed their keen interest as this can lead to earn money instead to traditional way of income through Bidi making which is harmful for their health. Through this training, trainees learned to make jute based handicraft models & Items like Jute doll, Durga face, Bird figure, flower vases and door matt etc. Trainees are very confident that, these skills to manufacturing high profitable handicrafts items will replace the traditional income through Bidi Making.

Ad-hoc Research Project

Retting of jute ribbon through application of chemical accelerator

Dr. D. P. Ray

Standardization of pH for Retting of jute ribbon

Jute plants of 90 to 120 days are generally harvested for retting. In our experiment we procured 110 days plant from Nadia, West Bengal. Freshly harvested jute plants were defoliated and the ribbons were taken out from the plants with the help of NIRJAFT power ribboner. Green jute ribbons (17.5 kg) were mechanically extracted from defoliated jute plants. Twenty beakers (5 litre) each containing 2.0 liters of water was taken and 300 g of ribbons were dipped in each beaker. In each beaker chemical accelerator developed by NIRJAFT was added with a quantity 0.1% of the total liqour. One beaker was kept as control which contained 2.0 liters of distilled water (pH=7) with ribbons dipped in it. The ribbon: liquor ratio was 1:5. The pH was regularly checked with digital pH meter.

Accelerated retting of ribbon at normal pH stonishing revealing

Within 12 days after immersion in the chemical accelerator solution, the retting was found to be completed and it took 8-10 days lesser time than conventional water retting. On addition of the chemical accelerator the pH of the solution was around 12. Perusal of the data presented in the table indicated that the addition of chemical accelerator causes the enhanced retting as compare to the control beaker. The pH of the sample water from each beaker was taken in regular intervals and it was found that uniform lowering of pH was occurred. Initially the pH of the solution was high due to addition of alkaline accelerator. The lowering of pH is happened due to release of acidic substances on initiation of retting. On day 3 drastic lowering pH was found. This may be attributed to the reason of enhanced microbial activities in jute plant followed by release of acidic substances. On 10th day onward, the retting of the ribbon was completed and the ribbons were washed in water. Due to less amount of ribbon, the water requirement for washing was minimum.

Exact retting pH for jute ribbon in laboratory condition

From the experiment, the exact end point of retting was determined through the controlled beaker retting. The exact pH on which retting occurs was also evaluated. This process is economical and farmer friendly as because it requires lower amount of water. The environment impact is lower because of lesser space and water requirement.

Activity: Contribution towards All India Network Research Project on jute & allied fibres

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

Jute, Mesta, Sunnhemp & Flax fibre samples grown under different agronomical condition at CRIJAF and participating research centres all over India were received under this network project. Total 543 samples

were tested during the reported period. The break up for the different fibre samples are given in table below:

Sample	Year	IET	AVT-1	AVT-ll
Kenaf	2010	6	5	6
Roselle	2010	10	7	6
Sunnhemp	2010	7	-	-
Tossa	2011	12	14	14
White	2011	20	14	18
Roselle	2011	18	36	36
Kenaf	2011	15	28	12
Tossa	2012	13	28	28
White	2012	9	24	21
Roselle	2012	-	14	18
Kenaf	2012	6	10	14
Sunnhemp	2012	21	24	15
Flax	2012	-	7	7
Total No		**137**	**211**	**195**
Grand Total			**543**	

Strength, fineness, root content percentage, defects percentage, colour and bulk density values of all the jute and mesta samples were carried out including their grading. For Sunnhemp and Flax fibres only strength parameter was evaluated. The test report was presented in the 27th Annual Workshop of AINP 2012-13 held at CRIJAF, Barrackpore on February 10.02.2013 under the chairmanship of Dr. P. Raghav Reddy, Former Vice-chancellor, ANGRAU, Hyderabad. After deliberation of the report by Dr. S. C. Saha, the house recommended the following:

- All centres are requested to send their fibre samples well in time with proper labeling and tagging. The jute crop must be harvested at 120 days as agreed upon.
- For making comparative and uniform quality assessment, similar production technology and uniform retting practices should be followed by all the centres.
- Uniform crop growth duration need to be followed by all the centres to minimize the influence of cultural practices and environments and to assess the inherent fibre quality of the varieties.
- NIRJAFT, Kolkata should organize a training programme for scientists and other technical staffs of all the AINP centres for their capacity building and better understanding in fibre quality assessment.

Ad-hoc Research Project

Application of agro-textiles for improvement of soil health

Dr. B. Saha

Base line survey was conducted in respect of socio-economic and bio-physical parameters in the Bhangar blocks of South 24 Parganas district of West Bengal. Scope of NIRJAFT to extend help in the above

mentioned aspects were explored. It was found that there were lots of scopes of research on application of agro-textiles in large scale vegetable growing areas. Agro-textile mulches of three different thicknesses of 250, 300 and 350 gsm along rice straw were laid in the field and soil health was assessed in the tomato growing plots.

Ad-hoc Research Project

Rot proof finishing of jute fiber by zinc naphthenate

Dr. L. Ammayappan and Mr. P. Singh

Zinc naphthenate (2% owm) was applied along with batching emulsion (2% owm) to jute reed prior to spinning in order to find its suitability as rot-proof finishing chemical. Rot proof efficiency (AATCC 30-2004, Test II), residual zinc content (ppm), FTIR & XRD of zinc naphthenate jute fiber , % moisture regain of jute reed during different stages of spinning, and stability of zinc naphthenate in emulsion state were evaluated.

The tensile properties of both conventional jute yarn and zinc naphthenate treated jute yarn were tested in the universal testing machine (Instron Model 4411) as per IS 1670:1991 and tabulated in Table 1. The maximum load at break of zinc naphthenate treated jute yarn shown 7% reduction in comparison with conventional jute yarn, while other parameters did not show any drastic reduction in comparison with control jute yarn. The reason may due to the diffusion of zinc naphthenate only inside amorphous region of the fiber.

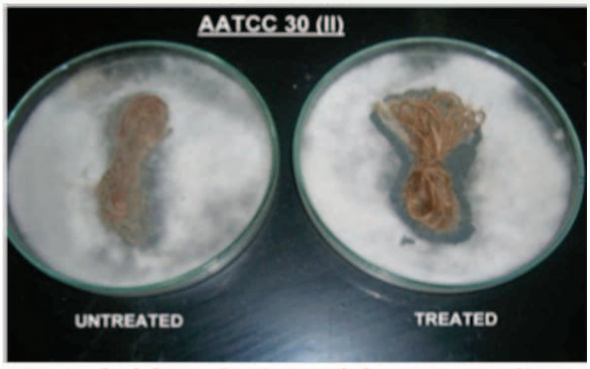
Table 1: Tensile properties of conventional and zinc naphthenate treated jute yarn

Parameters	Control Jute Yarn (50)	Zinc naphthenate treated jute yarn (100)
Maximum Load (N)	34.42	31.49
Yarn Tenacity (cN/Tex)	12.42	11.67
Modulus at 1% (cN/Tex)	773.68	779.75
Initial modulus (cN/Tex)	690.95	712.27
Breaking modulus (cN/Tex)	828.83	822.22

The stability of the zinc naphthenate based emulsion and conventional batching oil emulsion was studied by measuring the time required to form a separate layer from emulsion in a vertical measuring jar. It is observed that zinc naphthenate based emulsion has lesser stability (60 minutes) than jute batching oil system (180 minutes); however separation of batching oil in zinc naphthenate system (0.5mm) is lesser than conventional system (1mm). It is indicated that zinc naphthenate has good compatibility with batching oil for sufficient time (60 minutes).

The role of batching oil on jute reed during spinning is to keep the sufficient amount of moisture and to reduce the friction developed between the fiber and the machinery. The % moisture regain of the jute reed after zinc naphthenate application in every stage of the spinning was measured and tabulated in the It is observed that being an emulsion, zinc naphthenate treated jute reed keeps more moisture reduce the number of breakage in comparison with conventional spinning.

The antifungal activity of zinc naphthenate jute yarn and conventional jute yarn was assessed by AATCC



Zone of inhibition by Zinc naphthenate treated jute yarn against fungi (AATCC 30-2004, Test II)

Figure 1 : Antifungal activity of jute fibers

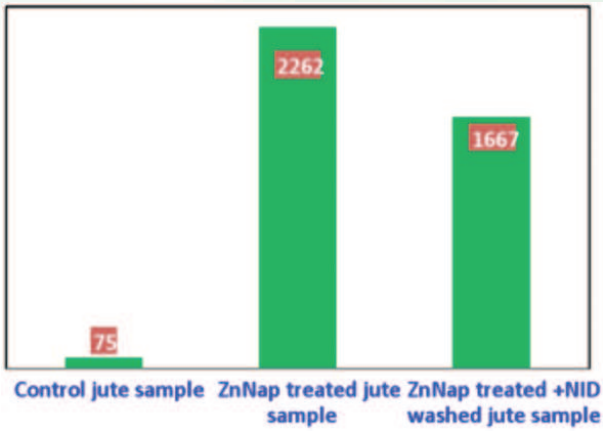


Figure 2: Residual zinc content in jute fibers

30-2004-Method II (figure 1). Zinc naphthenate treated jute fiber shown very good zone of inhibition (5.1 mm) while control jute fiber did not resist the fungal growth. It is inferred that zinc naphthenate has potential to prevent the microbial growth on jute since zinc metal generally denaturated the cell proteins of fungi and deactivating the functioning of the cytoplasmic membrane. The presence of zinc content on zinc naphthenate treated was confirmed by the atmospheric adsorption spectroscopy (Figure 2). From this graph, it is inferred that, Zinc naphthenate treated jute fiber has sufficient amount of zinc metal (2262 ppm) for resisting fungal growth and it could withstand up to after five washes (1667ppm).

In order to study, the effect of zinc naphthenate on the structural change of the jute fiber, the percentage of crystalline region by Scherrer's formula from XRD data and FTIR study were evaluated. It is found that zinc naphthenate did not have any influential effect on the structure and morphology of the jute fiber in comparison with control jute fiber, which is confirmed by XRD i.e. crystalline index of control and zinc naphthenate treated jute fiber were 65.65 & 65.61% respectively. It might be due to diffusion of zinc naphthenate occurs only in the amorphous region of jute fiber.

From this ad-hoc research work, it is concluded that

- Zinc naphthenate could be applied to jute fiber at batching stage of spinning along with batching oil, spun in the conventional system which gives 270-275 Tex yarn with lesser number breakage than conventional spinning system.
- Zinc naphthenate did not change the strength of yarn, morphology, crystallinity and functional group of jute fiber, however resisted the fungal growth better than control jute.

Institutional Activities

Institute Management Committee Meeting

The 64th meeting of Institute Management Committee was held on 14th May 2012 at 11.00 a.m. with the following members present.

- Dr. K.K.Satapathy, Director, NIRJAFT, Kolkata : Chairman
- Dr. K.K.Singh, Asstt. Director General (Process Engg) : Member
  ICAR, KAB II, Pusa, New Delhi
- Prof. S.M.Chatterjee, Ex-vice Chancellor, BESU : Member
- Dr. P.G.Patil, Head of TOT Divn : Member
  Central Institute of Research on Cotton Technology(ICAR)
- Dr. S.N.Jha, Head : Member
  Agricultural Structures & Environmental Control Division,
  Central Institute of Post Harvest Engineering Technology(ICAR)
- Dr. S.D.Deshpande, Principal Scientist (AS&PE) : Member
  Agro-Produce Processing Division,
  Central Institute of Agricultural Engineering(ICAR)
- Dr. Debasish Nag, Principal Scientist & Head of TOT Divn : Member
  NIRJAFT, Kolkata
- Mr. K.P. Nath, FAO
  Central Research Institute for Jute And Allied Fibres(ICAR) : Member
- Sri. Rajeev Lal, Chief Administrative Officer : Member Secretary
  NIRJAFT, Kolkata

Following QRT members of NIRJAFT attended the meeting as Special Invitee

- Dr. Prabir Kumar Banerjee, Ex- Professor, IIT, Delhi & Ex - Director , IJIRA, Kolkata : Chairman
- Dr. T. K.Guha Roy, Ex- Deputy Director, IJIRA, Kolkata : Member
- Dr. D. Sur, Ex Senior Deputy Director, IJIRA, Kolkata : Member
- Dr. P. G. Patil, Head, TOT Division, CIRCOT (ICAR) : Member
- Dr. S. N. Chattopadhyay, Principal Scientist, NIRJAFT : Member Secretary

At the outset Dr. K.K. Satapathy , Director, NIRJAFT & Chairman, Institute Management Committee welcomed all the members present in the meeting. He asked Shri. Rajeev Lal, CAO, NIRJAFT, being the member secretary of IMC to present the agenda items before the committee.

The member secretary welcomed the members of IMC and QRT to the meeting and hoped that the cross fertilization of ideas and views will immensely benefit the functioning of institute. He thanked Dr. K. K. Singh, ADG (PE), ICAR who was the motivator in organizing this meeting of QRT members with IMC.

The following were the agendas discussed in the meeting:

- Confirmation of the proceedings of the 63rd IMC meeting held on 14.2.2012
- Action taken report on the recommendation of the 63rd IMC meeting
- Presentation and discussion on draft report of QRT (2007-2012)
- Other item i.e. for consideration of the list of equipments planned for purchase and works items for execution in the first financial year 2012-13 of the 12th plan.

The meeting ended with thanks to the chair. All members were also thanked for their active co-operation and support.

Institute Research Committee Meeting

Two meetings of Institute Research Committee i.e. XII-1 and XII-2 were held during 15-16 May 2012 and 15-16 October 2012 respectively. Both the meetings were chaired by Dr. K.K.Satapathy, Director of the institute. In XII-1 IRC meeting, fifteen ongoing projects, two projects with extension proposal, eight completed projects, nine new project proposals were discussed in detail during the two days of the meeting. The discussion was added with the views of the following experts:

- Dr. B. C. Mitra, Ex-Director, NIRJAFT
- Prof. A. K. Samanta, Institute of Jute Technology, University of Calcutta
- Shri A. K. Khastagir, Ex-Chairman cum Managing Director, Jute Corporation of India, National Jute Board
- Dr. S. M. Chatterjee, Ex-Vice Chancellor, Bengal Engineering and Science Universities
- Prof. Sunanda Chanda, Agricultural & Ecological Research Unit, Biological Sciences Division, Indian Statistical Institute
- Dr. P.K. Das, Ex-Professor, BCKV, Kalyani
- Prof. Sunil Seth, Dept. of Jute & Fibre Technology, Institute of Jute Technology, University of Calcutta

In XII-2 IRC progress report of twenty one ongoing projects, one project with extension proposal and six new project proposals were discussed in presence of the following experts:

1. Dr. B. C. Mitra, Ex-Director, NIRJAFT
2. Dr. S. K. Bhaduri, Ex-Pr.Scientist & HoD, NIRJAFT
3. Shri D Paul, Ex-Pr.Scientist, NIRJAFT
4. Dr. B. S. Mahapatra, Director , CRIJAF
5. Dr. A. K. Ghorai, Pr.Scientist, CRIJAF
6. Dr. S. K. Sarkar, Sr.Scientist, CRIJAF
7. Dr. P. K. Das, Ex-Professor, BCKV, Kalyani
8. Shri I. J. Sharma, Consultant, Gloster Jute Company Pvt.Ltd.
9. Dr. Probal Majumder, Professor, Govt. College of Engineering & Textile Technology, Shrirampore
10. Shri Subimal Palit, Ex-Deputy Director, IJIRA, Jute Textile Consultant
11. Dr. A. Roychowdhury, Professor, Govt. College of Engineering & Textile Technology, Shrirampore
12. Shri Anindya Majumdar, Business Development Manager, The Jute Corporation of India Ltd.

Institute Joint Staff Council Meeting

Two meetings of Institute Joint Staff Council were held on 3rd July 2012 and 30th November 2012 with Dr K.K.Satapathy, Director, NIRJAFT as the Chairman. In the meeting on 3rd July 2012 the action taken report of the last IJC meeting, held on 16th January 2012, was read out by the member secretary and passed unanimously. Thereafter the agenda items discussed were : (i) whether the practice of forwarding the medical bill of employees through the Head of the divisions may be waived and timely settlement of medical claim of staff members; (ii) alleged difficulties in withdrawing money from GPF by staff members.

In the second meeting on 30th November 2012 the action taken report of the above IJSC meeting held on 3rd July 2012 was read out by the member secretary and passed unanimously. The agendas for discussion in that meeting were : (i) withdrawal of punishment case against Shri Ratan Sarkar, IJSC representative; (ii) transfer of mali (Garden Worker) to office / laboratory; and (iii) the scope of promotion from UD clerk to Assistant.

Vigilance Awareness

National Institute of Research on Jute and Allied Fibre Technology Celebrated Vigilance Awareness Week from 29th October to 3rd November, 2012. On this occassion the staff member of this institute took oath of integrity.

National Seminar at NIRJAFT in the occasion of its Platinum Jubilee Celebration

The Indian Natural Fibre Society (INFS), Kolkata had organized a National Seminar on "Jute and Allied Fibres in changing times: Issues and Strategies" from January 3-5, 2013 at NIRJAFT, Kolkata, in collaboration with National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT), ICAR, Kolkata, Central Research Institute for Jute and Allied Fibres (CRIJAF), ICAR, Barrackpore, West Bengal and National Jute Board (NJB), Ministry of Textile, Government of India, Kolkata in the occasion of the Platinum Jubilee Celebration of NIRJAFT, Kolkata.

Dr. S. Ayyappan, Secretary, DARE, Govt. of India & Director General, ICAR addressing the dignitaries in the Inaugural Session of the seminar

The seminar was inaugurated by Dr. S. Ayyappan, Secretary, DARE, Govt. of India & Director General, ICAR in presence of Dr. Subrata Gupta, IAS, Jute Commissioner, Govt. of India; Dr. P. Raghava Reddy, Ex- Vice Chancellor, Acharya N. G. Ranga Agricultural University, Andhra Pradesh; Prof. S. K. Dutta, Deputy Director General (Crop Science), ICAR; Dr. M. M. Pandey, Deputy Director General (Engineering), ICAR; Smt. Arti Kanwar, Secretary, National Jute Board, Ministry of Textile, Govt. of India; Sh. D. C. Baheti, Chairman, IJIRA and Executive Director, M/s. Gloster Ltd.; Sh. S. K. Chandra, Director, M/s. Hukumchand Jute Mills Ltd. and many more eminent personalities.

Dr. Subrata Gupta, IAS, Jute Commissioner, Govt. of India

The inaugural session was followed by three invited lectures by Prof. (Dr.) B. S. Mahapatra, Director, CRIJAF; Sh. D. C. Baheti, Chairman, IJIRA and Executive Director, Gloster Ltd. and Dr. D. Sur, Ex. Senior Deputy Director, IJIRA.

A national seminar participated by Government bodies, members of industry, academia of eminence, leading specialists, a good number of research scholars and scientists in the concerned discipline, provided a platform for deliberating multidisciplinary topics related to jute and allied fibres, heralding a new direction for R&D activity. 39-papers and 33 posters were presented in the Agricultural Session and 41 papers and 14 posters were presented in the Technical Session.

There were two sessions running parallel to each other from 4th to 5th January, 2013, one being on Agriculture and other on Technology.

The Agriculture session was sub-divided into five sub-sessions, namely:

- Production status and constraints of jute and allied fibre crops (PSC): chaired by Prof. (Dr.) P. Raghava Reddy
- Improvements of jute and allied fibre crops (CI): chaired by Prof. (Dr.) P. Raghava Reddy
- Methods for crop establishment, water and nutrient management (CEWNM): chaired by Dr. N. Gopala Krishnan
- Disease and insect/pest management (DIPM): chaired by Dr. R. K. Mondal
- Improved machine & fibre extraction (IMFE): chaired by Dr. D. Nag

The Technology session was sub-divided into seven sessions, namely:

- Fibre Extraction: chaired by Dr. P. K. Das
- Quality evaluation and grading: chaired by Dr. D. Sur
- Agro and Geotextiles applications: chaired by Mr. A. K. Khastogir
- Mechanical Processing: chaired by Dr. P. Roy
- Chemical Processing: chaired by Shri S. M. Chatterjee
- Value added products: chaired by Dr. B. C. Mitra
- Energy, Environment and other issues: chaired by Dr. B. C. Mitra

The recommendations emanating from each session are as follows.

The sub-session titled **"Production status and constraints of jute and allied fibre crops (PSC)**

- The constraints of jute and allied fibres crop based production systems need to be analysed and

categorised into research gaps and extension gaps. The researchable issues have to be addressed on priority basis with a time bound programme.

- The major constraints in jute and allied fibre crops that had come out in the presentations are improved varieties with fine fibre quality and drought tolerance. Inadequate supply of quality seeds, ineffective weed management, imbalanced fertilizers and low input use efficiency still affects production. Effective retting technology is yet to be popularized. High labour requirement and lack of marketing facilities need to be tackled. Research programmes are to be planned meticulously to address these researchable issues.
- Area expansion programme of Ramie in Assam and Sisal in Odhissa through PPP model is commendable job carried out by CRIJAF. Similar emphasis has to be given in respect of Sunnhemp and Flax crop also.
- Explore and develop the new fibre crops to enhance the availability of the natural fibres for effective utilizations.

The sub-session titled "Improvements of jute and allied fibre crops (CI)"

- Biotechnological research in jute especially genomics of fibre quality character and genome sequencing are need of the hour. More initiatives should be taken to strengthen genomics and molecular breeding in jute and allied fibres.
- DUS testing in jute and allied fibres should be initiated and molecular markers should be used for testing.
- In kenaf, improved varieties can be developed duly overcoming the barriers of interspecific hybridization and by using appropriate selection in segregating generations. Further, information on combining ability analysis can be utilised in augmenting the breeding efforts to develop best varieties in different niche areas.
- Diversity analysis in flax germplasm has indicated that there is sufficient variability for further improvement. The plant ideotype having tall plant with branches only at the top and high fibre content can form the basis for selection for developing fibre flax with high yield and fine fibre.

The sub-session titled **"Methods for crop establishment, water and nutrient management (CEWNM)"**

- More emphasis has to be given on research on improving the water productivity of jute and allied fibre crops considering the changing climatic conditions.
- The effective weed control methods should be demonstrated more exhaustively and the awareness programmes about the utility of implements to the farmers should be taken up.
- Location specific application based on soil test values need to be promoted against the blanket fertilizers application as it will increase the system yield and maintain soil health on long-term basis.
- More emphasis has to be given on area expansion of allied fibre crops like ramie, sisal, sunnhemp and flax.
- The chairman also emphasized on reducing the cost of cultivation to increase the profitability of jute and allied fibres crop based production systems.

The sub-session titled **"Disease and insect pest management (DIPM)"**

- The screening programme for obtaining resistance sources against insect pests, particularly sucking pest, the tolerance index should be considered along with other parameters.
- The efficiency of germplasm screening against insect pest and diseases can be improved through advanced methodology particularly under artificial conditions with effective inoculation technique.
- Screening of germplasm against pest/disease at a time in a particular location need to be taken up for a definite conclusion.
- Determination of population density of *M. phaseolina* in soil by molecular or any other method to be given priority to manage the disease (stem rot/ root rot) in more effective manner as it is predominantly soil borne pathogen.

The sub-session titled **"Improved machine & fibre extraction (IMFE)"**

- The viable technologies must be transferred to the farmers through effective extension methods.
- Prior to the design and fabrication of the machine, SWOT analysis must be carried out.
- There should be joint effort from Ministry of Textile & Ministry of Agriculture for popularization of machines and retting technology.
- CRIJAF and NIRJAFT should seat together for evolution of better technology for extraction of jute and allied fibres.

Technology:

The sub-session titled **"Fibre Extraction"**

- Fungal retting (dry retting) process technology for jute is to be optimized to escape the scarcity of water problem as well as to combat global warming through minimal production of methane gas.
- Integrated package of practices for extraction of fibre and residues utilization for pineapple leaf is to be developed.
- Efficient, cost effective and high capacity jute ribboner needs to be developed for making whole extraction process farmer-friendly.
- More research work has to be carried out on molecular characterization of bacteria involved in accelerated retting of jute for effective and quicker transfer of the process know-how.

The sub-session titled **"Quality evaluation and grading"**

- The integrated jute grading system needs to be refined further to make it user friendly.
- Hairiness measurement of jute products is one of the important parameter and can be evaluated for further use.
- Multicriteria decision making system will be useful tool for future gradation of jute fibres

The sub-session titled **"Agro and geo-textiles applications"**

- Technology development to improve durability of geo-textiles through fabric engineering and application of eco-friendly finishes.

- Cost of construction of geo-textiles can be studied and possible steps to be identified to reduce the cost and overcome the drawbacks vis-a-vis synthetic geo-textiles.
- Regarding the market share of jute geo-textiles and agro-textiles, the chairman recommended to promote and popularise geo-textiles through concerted effort by all stakeholders in jute. The manufacturer's role should be more proactive.
- Availability of JGT and JAT of proper specification for proper end used needs to be ensured.

The sub-session titled **"Mechanical Processing"**

- Knitting technology with jute based yarns may be applied in different technical textiles
- Banana fibre can be tried for coarse technical textiles instead of fine jute yarns
- Measurement technique for force is required as we are trying for low GSM fabrics in packaging
- Friction spinning may be explored in research studies. Some other modern machineries may be tried

The sub-session titled **"Chemical Processing"**

- Measurement of particle size of nanoparticles is absolutely necessary
- Chemical free dyeing i.e. bio route of dyeing is needed for coloration of jute fabrics
- More focus should be given on marketing of natural dyed materials
- Polyethelyne glycol may be needed for performance properties of jute based fabrics.

The sub-session titled **"Value added products"**

- Emphasis to be given on geo-textiles and non-wovens, because this is lifeline of jute and allied fibre industry
- Tissue paper production from jute fibre is a better idea for diversification.
- Modification of jute fibre with natural material like lac, is very important for development of jute based bio-composites.

The sub-session titled **"Energy, Environment and other issues"**

- Environmental issues may be highlighted with costing of the process
- Chemical finishing may be developed by keeping polluting nature of the process in consideration
- A case study or adhoc-work may be undertaken for planning a project
- Pellets from jute stick may be used in the effluent treatment plant for process pollutants
- Low cost, eco-friendly alternative chemical may be identified for the replacement of conventional chemical finishing.

Summer School on "Processing, value addition and waste utilization of jute and other allied fibers" sponsored by Indian Council of Agricultural Research, New Delhi

NIRJAFT organized a summer school for duration of 21 days from 26th June to 16th July, 2012. Thirteen participants from different parts of India attended this programme. Actually 18 participants responded for

participation. But due to some reasons or the other, only thirteen could join the programme ultimately. Arrangements were made to keep the participants in the NIRJAFT's Scientist Home. Boarding arrangement was made with the assistance of canteen staffs of the institute.

Thirty-one theoretical lectures on different aspects of cultivation, retting, processing, utilization of fibres and their residues were arranged. Economic and environmental aspects related to jute cultivation and processing were also given importance for the overall knowledge of the participants. More than thirty lecturers were delivered by resource persons from NIRJAFT, CRIJAF and CIRCOT. Resource persons were leading specialists in their own fields. A publication with all the lecture materials was published and distributed among the participants. Everyday theoretical classes were held before lunch session and the practical classes were conducted in the post lunch session. Practical on almost all processing technologies were demonstrated to the participants by the resource persons. Arrangement was also made for six invited lectures by six eminent persons in the field. Dr. S. K. Chattopadhyay, Acting Director, CIRCOT was one of those guest lecturers.

The participants were taken to one small scale unit and one jute mill for on the spot study of the processes. Visit of Central Research Institute for Jute and Allied Fibre (CRIJAF), Barrackpore was also arranged to demonstrate the cultivation practices of jute and allied fibre crops. They were also shown the germplasm collection at CRIJAF.

Overall it was a successful programme. Feedback information in prescribed proforma was collected from the participants. Some samples of feedback information submitted by the participants after completion of the school were submitted to ICAR.

Open Day Celebration at NIRJAFT 8 October, 2012

In-house Seminar

The following in-house seminars were held in the institute:

Sl. No.	Date	Speakers	Topic
1.	1 June 2012	Dr.S.Debnath	Spinning of fine yarn in jute spinning machinery
2.	8 June 2012	Shri Nilamani Kundu	Development of cotton/PLA blended yarns
3.	8 June 2012	Shri P.Y. Verma	Effect of twist on tensile property & abrasion resistance of friction spun plied yarn
4.	22 June 2012	Informatics people	A talk on informatics
5.	6 July 2012	Kaushik Bal	Science and Textiles
6.	7 July 2012	Dr. A. K. Roy	Jute as an alternative raw material for paper packaging
7.	13 July 2012	Er.V. Kadam	Ultrasound scouring of wool & its effects on fibre quality
8.	13 July 2012	Dr. K. K. Samanta	Application of plasma technology for processing and finishing of textiles
9.	21 July 2012	Dr. D. Nag	Entrepreneurship and Venture Capital
10.	3 August 2012	Mou Chakraborty	Quality Evaluation of fibre using image processing system
11.	29 September 2012	Dr. S. Sengupta	Patent application topic
12.	29 September 2012	Dr. S. Sengupta	Patent application topic
13.	3 November 2012	Dr. Debabrata Paul	Energy from jute biomass and agro-residues
14.	29 November 2012	Dr. N. C. Pan	Development of cassava stalk particle board using bio-adhesives
15.	29 November 2012	Dr. S.N.Chattopadhyay	Application of enzymes for hand-made paper production
16.	16 January 2013	Dr. V. B. Shambhu	Production of bio-diesel from jatropha & characterization of its bio-diesel
17.	16 January 2013	Dr. V. B. Shambhu	A low cost seed drill for showing jute seeds
18.	21 January 2013	Dr. L. Ammayappan	Effect of pretreatment for in-situ formation of silver nanoparticle on jute fibre
19.	21 January 2013	Dr. S. K. Dey	A combined technology package for extraction of pineapple leaf fibre-an agro-waste, utilization of biomass and for application in textiles
20.	4 February 2013	Dr.S.N.Chattopadhyay	Dyeing of jute with natural dyes for improvement of colour yield and UV protection properties
21.	4 February 2013	Dr. S. C. Saha	User-friendly jute grading system-an easy method
22.	5 February 2013	Dr. D. P. Ray	Extraction of textile grade ramie fibre through improved degumming technology
23.	5 February 2013	Dr. L.K.Nayak	Role of training towards entrepreneurship development in jute sector
24.	5 February 2013	Dr. L.K.Nayak	Knowledge sharing using cloud computing

Seminar/ Conference/ Workshop/ Meeting Attended

Subject	Venue	Date	Participants
Cost committee meeting of NFBSFARA at KAB-I, Pusa, New Delhi	I C A R, New Delhi	3-6 April, 2012	Dr. P. K. Ganguly Dr. D. P. Ray
Meeting of Knowledge management sub group for 12th Plan at NJB, Kolkata	National Jute Board, Kolkata	4 June, 2012	Dr. D. Nag Sh. S. Das
3rd Installation Training-cum- Workshop under the NAIP project "Strengthening Statistical Computing for NARS" conducted at Directorate of Water Management, Bhubaneswar	Directorate of Water Management, Bhubaneswar	22 June, 2012	Dr. L. K. Nayak Dr. D. P. Ray
Awareness workshop on "Carbon foot print for JDP SMEs-A step towards eco-friendliness" sponsored by an NGO, Margdarshak	NIRJAFT, Kolkata	23 June, 2012	Scientists and Technical Officers
21 days Summer School on "Processing, value addition and waste utilization technologies for jute and other allied fibres" sponsored by ICAR, New Delhi	NIRJAFT, Kolkata	26 June-16 July 2012	Dr. L. Ammayappan Sh. P. Verma Sh. N Kundu
Interactive session on "Jute and Bengal", organised by Bharat Chamber of Commerce	Park Hotel, Kolkata	2 July, 2012	Dr. K. K. Satapathy Dr. D. Nag Dr. A. K. Roy Dr. G. Basu Dr. G. Roy Dr. S. N. Chattopadhyay Dr. S. B. Roy Dr. L. K. Nayak Dr. D. P. Ray
Symposium on "Science for shaping the future of India".	Meghnad Saha Audi -torium, University Colleges of Science and Technology, University of Kolkata	27 July, 2012	Dr. L. K. Nayak Sh. S. Das
World Water Week, 2012	Stockholm, Sweden	26-31 August, 2012	Dr. B. Saha

Subject	Venue	Date	Participants
Workshop on "Library Automation: Impact on dissemination of scholarly output of an R & D organization" organised by NIRJAFT Kolkata	NIRJAFT Kolkata	28 September, 2012	Scientists and Technical Officers
Panel discussion on "Water for sustainable agriculture" organised by the Agricultural Engineering Division, the Institution of Engineers, Kolkata	Sri R N Mukherjee Hall, West Bengal State Centre, the Institution of Engineers (India), 8, Gokhle Road, Kolkata - 700 020	5 October, 2012	Dr. S. N. Chattapadhyay Dr. S. Debnath Dr. L.K. Nayak Dr. D.P. Ray Sh. S. Das
The CIC & 7th CAC Meeting of NAIP-III project, "Sustainable rural livelihood empowerment project for northern disadvantaged districts of West Bengal"	Dakhin Dinajpur KVK	9-10 October, 2012	Dr. S. Debnath
National Seminar on library-publisher partnership convergence of content and technology in the Digital Age organized by Informatics India Ltd., in association with Annual Reviews, Future Science Group, Royal Society Publishing and IET	Hyatt regency, JA-1, Sector III, Salt Lake City	18 October, 2012	Dr. S. N. Chattapadhyay Dr. S. Debnath
Advisory committee meeting of the project NFBSFARA-FQ-3029	NIRJAFT, Kolkata	26 October, 2012	Dr. P. K. Ganguly Dr. D. P. Ray Dr. S. Debnath
India International Trade Fair - 2012	Pragati Maidan, New Delhi	14-27 November, 2012	Dr. L.K. Nayak
Workshop on "Research project proposal development" sponsored by National Fund for Basic, Strategic and Frontier Application Research in Agriculture, ICAR, New Delhi conducted by NAARM (ICAR)	NAARM, Hyderabad, Andhra Pradesh	22-24 November, 2012	Dr. P. K. Ganguly Dr. L. Ammayappan Dr. D. P. Ray
Meeting of The Indian Natural Fibre Society	CRIJAF, Barrackpore	01 December, 2012	Dr. P. K. Ganguly Dr. D. P. Ray

Subject	Venue	Date	Participants
"BIS Meeting" organised by BIS, India	NIRJAFT, Kolkata	08 December, 2012	Dr. S. Debnath
Sensitization meeting for PME Cell under the chairmanship of DG, ICAR	NDRI, Karnal	8 December, 2012	Dr. M. K. Basak Dr. U. Sen
ICAR-Public Outreach Session under the chairmanship of DG, ICAR, in 100th Indian Science Congress 2013	Calcutta University, Kolkata	4 January, 2013	Dr. S. B. Roy Dr. U. Sen
ICAR Chemists' Conclave (an interactive meet) conducted by Department of Agricultural Chemicals, Indian Agricultural Research Institute, New Delhi	IARI, New Delhi	14-15 January, 2013	Dr. L. Ammayappan Dr. D.P. Ray Dr. S. N. Chattopadhyay Dr. N.C. Pan
International seminar on "Fashion in the global economy : emerging challenges and new directions" organised by National Institute of Fashion Technology (NIFT), Kolkata and Confederation of India Industries (CII)	NIFT, Kolkata	19 January, 2013	Dr. N. C. Pan Dr. S. N. Chattopadhyay
"Technology transfer/dessimination on development of low cost dense jute nonwoven fabric" organised by NIRJAFT, Kolkata & National Jute Board, Kolkata	W M Hall, 1st Level, Bengal Chamber of Commerce & Industries Building, 6, N.S. Road Kolkata - 700 001	29 January, 2013	Dr. S. Sengupta Dr. S. Debnath
9th All India People's Technology Congress organised by FOSET	Science City, Kollkata	8-9 February, 2013	Dr. A. K. Roy Dr. B. Saha Dr. S. N. Chattopadhyay Dr. N. C. Pan Dr. Utpal sen Dr. S. C. Saha
27th Annual Workshop of AINP	CRIJAF, Barrackpur West Bengal	10-11 February, 2013	Dr. S. C. Saha

Subject	Venue	Date	Participants
CIC & CAC Meeting and Krishi Mela of NAIP-II project, "A value chain on coconut fibre and its byproducts: manufacture of diversified products of higher value and better marketability to enhance the economic returns of farmers"	ICAR Research Complex for Goa Ela, Old Goa	12 February, 2013	Dr. A. N. Roy Dr. S. Debnath
Training on "Operation and maintenance of weather fastness tester" conducted by NIRJAFT, Kolkata	NIRJAFT, Kolkata	11-13 February, 2013	Scientists and Technical Officers
Six days workshop on "Strengthening Statistical Computing for NARS" sponsored by Directorate of Water Management, Bhubaneswar, Odisha	NIRJAFT, Kolkata	25 February - 2 March, 2013	Dr. B. Saha Dr. A. N. Roy Dr. D. P. Ray Dr. L. K. Nayak Dr. L. Ammayappan Dr. S. C. Saha Dr. S. B. Roy Dr. S. Banik Dr. V. B. Shambhu Dr. S. N. Chattopadhyay Dr. N. C. Pan Dr. S. Sengupta Dr. S. Debnath Dr. S. K. Dey Dr. U. Sen
Meeting of Kolkata Town Official Language Implementation Committee	All India Institute of Hygenic and Public Health, 110, Chittaranjan Avenue, Kolkata-700073	6 March, 2013	Sri R. D. Sharma Sri K.L. Ahirwar
Meeting for discussion on enzymatic retting of jute ribbons/ plants for quality at National Jute Board with Secretary, National Jute Board, Assistant Director (T), Jute Commissioner, Representatives of the Jute Corporation of India and other Concerned Scientists from IJIRA and NIRJAFT	National Jute Board, Kolkata	7 March, 2013	Dr. S. Banik Dr. D. P. Ray

Subject	Venue	Date	Participants
"Agribusiness campaign" organized by NIRJAFT in collaboration with Bengal National Chamber of Commerce and Industries, Kolkata and Agri-Bussiness Incubator, ICRISAT, Hyderabad	BNCCI House, 1st Floor, 23 R N Mukherjee Road, Kolkata 700001	18 March, 2013	Dr. K. K. Satapathy Dr. D. Nag Dr. P. K. Ganguly Dr. G. Basu Dr. A. K. Roy Dr. S. N. Chattapadhyay Dr. A. N. Roy Dr. S. B. Roy
Awareness Programme on ISO 9001-2008 by Chief Consultant, AQL Systems and Consultants	NIRJAFT, Kolkata	20 March, 2013	Scientists, Technical Officers, RAs, SRFs
Symposium for felicitating Professor Sankar K. Pal, Distinguished Scientist, Indian Statistical Institute, Kolkata to be conferred PADMA SHRI "Future of Stem" (Science, Technology, Engineering and Mathematics)"	Platinum Jubilee Academic Building Auditorium, ISI, Kolkata	22 March, 2013	Sh. S. Das
62nd Anniversary One Day Technological Conference on "Challenges & opportunities in textiles" organized by The Textile Association (India) West Bengal Unit	Dept. of Jute and Fibre Technology, University of Calcutta, Kolkata	23 March, 2013	Dr. N. C. Pan Dr. S. N. Chattopadhyay Dr. S. C. Saha
CIC & 8th CAC Meeting of NAIP-III project, "Sustainable Rural Livelihood Empowerment Project for Northern Disadvantaged Districts of West	Uttar Banga Krishi Viswavidalaya, Pundibari, West Bengal	25-26 March, 2013	Dr. S. Debnath

Publication

Paper Published

- Chattopadhyay, S. N., Pan, N.C., Roy, A.K. & Khan, A. (2012). Dyeing of jute fabric with natural dye extracted from manjistha, *International Dyer* (UK), 197(6), 34-40.
- Das, S. and Nayak, L.K. (2012). Expert System for Agriculture Extension. *Indian Journal of Automation and Artificial Intelligence.* 1(2) : 62-64.
- Debnath, S. and Madhusoothanan, M .(2012). Compression behaviour of jute-polypropylene blended needle-punched nonwoven under wet condition. *Journal of The Textile Institute.* 103(6):583 - 594, DOI: 10.1080/00405000.2011.592662.
- Debnath, S. and Madhusoothanan, M. (2012). Compression creep behaviour of polyester needle-punched nonwoven fabric. *Journal of The Textile Institute.* April 18, 2012, DOI: 10.1080/00405000.2012.680696.
- Debnath, S. and Madhusoothanan, M. (2012). Studies on compression properties of polyester needle-punched nonwoven fabrics under dry and wet conditions. *Journal of Industrial Textiles.* 4: 292-308. DOI: 10.1177/1528083711416394.
- Debnath, S. and Madhusoothanan, M.(2012). Compression creep behavior of jute-polypropylene blended needle-punched nonwoven. *Textile Research Journal.* 82(20):2097-2108, DOI: 10.1177/0040517512445336.
- Nayak, L.K., Ammayappan, L., and Ray, D.P. (2012). Chemical treatments of jute stick for industrial application-A review. *Journal of Indian Chemical Society.* 89(12): 1723-1727.
- Nayak, L.K., Ray, D.P. and Shambhu, V.B. (2013). Appropriate technologies for conversion of jute biomass into energy. *International Journal of Emerging Technology and Advanced Engineering.* 3 (3), pp: 570-574.
- Pan, N. C., Chattopadhyay, S.N., Roy, A.K., Khan, A. & Patra, K. (2013). Application of biotechnology in the coloration of jute fabric using vinyl sulphone type of reactive dyes, *Journal of Textile Science & Engineering (USA, Open access & refreed)*, 3(1).
- Ray, D.P., Ammayappan, L., Nayak, L.K. et.al.(2012). Sustainable rural livelihood through utilization and value addition of banana fiber. *Journal of Interacademicia.* 16(3): 792-800.
- Roy, A. K. & Chattopadhyay, S.N. (2012). Jute and alternative raw material to packaging paper, *IPPTA Journal,* 24(3), 121-124.
- Roy, G. and Saha, S. C. (2013). Electronic Fineness Tester of Jute and Allied Fibres. *Indian Journal of Fibre & Textile Research.* 38 : 106-108.
- Sengupta, S. and Debnath, S. (2012). Studies on Jute-based ternary blended yarn. *Indian Journal of Fibre & Textile Research.* 37(3): 217-223.
- Sengupta, S. and Sengupta, A. (2013). Electrical resistance of jute needle punched nonwoven fabric-effect of punch density, needle penetration and area density. *Journal of The Textile Institute.* 104(2): 132-139.

Paper presented in seminar/conference/workshop

- **Following are the papers, were presented in National seminar on jute & allied fibres in changing times: issues and strategies, organized by The Indian Natural Fibre Society (INFS), Kolkata, in collaboration with NIRJAFT, ICAR, Kolkata, CRIJAF, ICAR, Barrackpore, West Bengal and NJB, Ministry of Textile, Government of India, Kolkata in the occasion of Platinum Jubilee celebration of NIRJAFT, Kolkata during 3-5 January, 2013**

- Ammayappan, L., Debnath, S. & Sengupta, S. Performance properties and cost analysis of softness finishing on jute based fabrics.
- Ammayappan, L., Ray, D.P., Das, S., Guruprasad, R. & Ganguly, P.K. Effect of lac treatment on performance properties of jute fabric based bio-composites in comparison with alkali treatment and peroxide bleaching treatment.
- Ammayappan, L., Roy A.N., Functional finishing of jute textiles.
- Ammayappan, L., Ray, D. P., Roy, A.K., Role of chemical treatments for value addition of jute and allied fibre products.
- Ammayappan, L., Ray, D.P., Nayak, L.K., Roy, A.K., Ganguly, P.K., Development of quality jute fibre boards to meet BIS standard.
- Banik, S. Dry retting of jute - A challenge to fight with evil consequences owing to global warming.
- Basu, G. & Roy, A.N. Composite structured natural fibre-based geo-textiles.
- Bhaduri, S.K. & Basak, M.K. Identification of *Bacillus stratosphericus* responsible for water saving accelerated retting of jute.
- Bhowmick, M., Chattopadhyay, S.K. & Dey, S.K. Composite yarns for technical textiles from natural fibres based on friction spinning technology.
- Chakraborty, M. & Roy, G. A novel and low-cost method of colour identification using Image processing system for natural fibres.
- Chattopadhyay, S.N., Pan, N.C., Roy, A.K. & Khan, A. Dyeing of jute fabric with natural dye extracted from annatto.
- Das, S. Decision support system for analyzing variability of linear density of jute yarn.
- Das, S., Wireless Sensor Networks for Climate Management Systems.
- Das. S., Ammayappan, L., Ray, D.P. and Nayak, L.K. Cloud computing based knowledge management systems.
- Dey, S.K. & Satapathy, K.K. Engineering of pineapple leaf fibre-an agro waste for application in technical textiles.
- Dey, S.K., Upadhay, D.L., Chattopadhyay, S.K., Indigenous Ramie for woven and knitted textiles.
- Mohan, N.H., Das, A., Debnath, S., Nayak, L.K., Mustafa, I. & Satapathy, K.K. Physical characteristics of hair fibre obtained from different breeds of pigs,
- Nag, D., Nayak, L.K. & Banik, S. Extraction of fibre from pineapple leaf.
- Nayak, L.K., Ammayappan, L. Das, S. & Soren, R. Conversion of Jute waste (jute stick and jute caddies) into biomass energy.

- Nayak, L.K., Saha, S.C., Shambhu, V.B. and Ray, D.P. Extraction of fibre from banana pseudostem.
- Pan, N.C., Chattopadhyay, S.N., Roy, A.K., Khan, A. & Patra, K. Application of bio-technology in the colouration of jute fabric using vinyl sulphone type of reactive dyes.
- Ray, D.P., Banik, S., Basak, M.K., Islam, S., Banerjee, P., Chakraborty, S., Mandal, S.B. & Manna, K. Bio-fungicide from jute seed oil.
- Ray, D.P., Banerjee, P., Mandal, S.B., Satya, P., Mitra, S., Ramie Degumming through Novel Chemical Process.
- Ray, D.P., Ganguly, P.K., Ammayappan, L., Debnath, S., Mandal, D., Chakraborty, S., Islam, Md. S., Synthesis of Coupling agents for Jute Based Bio-composites.
- Roy, A.K., Chattopadhyay, S.N. & Chauhan, S. Tissue paper for archival use from jute.
- Roy, A.N., Basu, G. & Pan, N.C. Processing of banana fibre in jute spinning system.
- Roy, G., Saha, S.C. & Chakraborty, M. Electronic and microprocessor based integrated instrument for jute grading - A novel approach.
- Roy, S.B. Project planning, development and cost-benefit analysis for product manufacturing.
- Saha, S.C., Sen, U. & Ghosh, A. User-friendly jute grading system - an approacha.
- Sen, U., Roy, S.B., Roy, A.K., A Quality evaluation for improvement of Training on Agro-residue management technology at NIRJAFT.
- Sengupta, S., Debnath, S., Bose, G. & Satapathy, K.K. Use of jute in agriculture.
- Shambhu, V.B., Ganguly, P.K., Nayak, L.K., Sanyal, P. & Choudhary, P. Development of NIRJAFT power ribboner for jute & mesta.

- Ammayappan, L., Ray, D. P., Roy, A. K. & Chakraborty, S.Effect of pretreatments on in-situ formation of silver nanoparticle on jute fibre, First International Conference on Bio-resources and Stress Management held at Science City, Kolkata, on 7 February, 2013.
- Ammayappan, L., Ray, D. P., Singh, P. & Chakraborty, S., Rot proof finishing of jute using zinc naphthenate, 100th Indian Science Congress Association held at Calcutta University, Kolkata, on 6 January, 2013.
- Basu, G. Development of coconut-jute fibre blended jute yarn, Four day International Buyer-seller meet and seminar on coir products, “Coir-Kerala, 2013” at Alleppy, Kerala, 2-5 February 2013 organized by Coir Board and Govt. of Kerala.
- Chattopadhyay, S.N. Jute-an alternative raw material for packaging paper, Seminar on “ Agro and recycled fibre pulping, bleaching and paper & board making”, organized by Indian Pulp and Paper Technologists Association, at Chandigarh, 19-20 July 2012.
- Chattopadhyay, S.N. Biotechnological intervention for making handmade paper from jute, National Carbohydrate Conference, CARBO-XXVII on “Prospects and perspective of glycoscience and allied technologies”, organized by CSIR-Central Food Technological Research Institute (CFTRI) in collaboration with Association of Carbohydrate Chemists and Technologists (India), at CSIR-CFTRI, Mysore, Karnataka, 13-15 December 2012.
- Chattopadhyay, S.N. Dyeing of jute with natural dyes with improved colour yield and UV protection properties, Centenary session of 100th Indian Science Congress, organized by The Indian Science Congress Association, Kolkata in collaboration with University of Calcutta ; Bose Institute , Kolkata and Jadavpur University, Kolkata, at Kolkata, 3-7 January, 2013.

- Chattopadhyay, S.N. Natural dyeing of jute fabric for improved colouration and UV protection characteristics, 9th All India Peoples Technology Congress, organized by Forum of Scientists ,Engineers and Technologists (FOSET), Kolkata, at Science City Auditorium, Kolkata, 8-9 February 2013.
- Das, S., Image processing for analysis of defects of jute fabrics, Centenary session of 100th Indian Science Congress, organized by The Indian Science Congress Association, Kolkata in collaboration with University of Calcutta; Bose Institute, Kolkata and Jadavpur University, Kolkata, 3-7 January 2013.
- Das, S., and Nayak, L.K. Knowledge sharing using cloud computing, XIth Agricultural Science Congress at Odisha University of Agriculture & Technology, Bhubaneswar, Odisha, 7-9 February 2013.
- Nayak, L.K. Energy from jute stick through charring and pelletization, 100th Indian Science Congress organized by Calcutta University, Kolkata, 3-7 January 2013.
- Nayak, L.K., Roy, S.B. and Das. S. Role of training towards entrepreneurship development in jute sector, XIth Agricultural Science Congress at Odisha University of Agriculture & Technology, Bhubaneswar, Odisha, 7-9 February 2013.
- Pan, N.C. Development of cassava stalk particle board using polysaccharide based bioadhesives, National Carbohydrate Conference, CARBO-XXVII on "Prospects and perspective of glycoscience and allied technologies", organized by CSIR-Central Food Technological Research Institute (CFTRI) in collaboration with Association of Carbohydrate Chemists and Technologists (India), at CSIR-CFTRI, Mysore, Karnataka, 13-15 December 2012.
- Pan, N.C. Application of biotechnology in the coloration of jute fabric using dichloro triazine type of reactive dyes, Centenary session of 100th Indian Science Congress, organized by The Indian Science Congress Association, Kolkata in collaboration with University of Calcutta; Bose Institute, Kolkata and Jadavpur University, Kolkata, 3-7 January 2013.
- Ray, D. P., Banerjee, P., Islam, S. & Chakraborty, S., Retting of jute ribbon through application of chemical accelerator, Centenary session of 100th Indian Science Congress, organized by The Indian Science Congress Association, Kolkata in collaboration with University of Calcutta; Bose Institute, Kolkata and Jadavpur University, Kolkata, 3-7 January 2013.
- Roy, G. Quality evaluation of fibre using image processing system, All India seminar on computing, communication and sensor network, PIT, Orissa, 22-23 October, 2012.
- Roy, G. Instrumentation for quality evaluation of ligno cellulosic fibres, The 100th Indian Science Congress, at Kolkata, 3-7 January 2013.
- Roy, G. A new micro controller based electronic fibre bundle strength tester for jute, The 20th West Bengal State Science & Engineering Congress at Bengal Engineering and Science University, 1 March 2013.
- Sengupta, S. Development of low cost dense jute nonwoven fabric, A technology transfer/dissemination Seminar, organized by NIRJAFT at W. M. Hall, 1st level, BCCI building, 6, Netaji Subhash Road, Kolkata 700001, 29 January 2013.

Books/Book Chapters

- A book entitled "Diversification of Jute and Allied Fibres : Some Recent Developments" edited by Dr. K. K. Satapathy and Dr. P. K .Ganguly (pp 348) has been published in the occasion of the year-round Platinum Jubilee Celebration of NIRJAFT (1939 - 2013). The contributors were :

- Ammayappan, L., Ray, D. P. & Nayak, L. K. (2013) Value Addition of Jute Textiles: Present Status and Future Perspectives, Page No. 203-224.
- Banik, S. (2013) Biogas Generation from Industrial Waste of Jute can Fetch Carbon Credit for Jute Industry, Page No. 315-328
- Basu, G. (2013) Influence of Jute Fibre Characteristics on Its Processibility and Yarn Properties, Page No. 29-39.
- Basu, G., Roy, A. N., Sanyal, P., Mishra, L. & Satapathy, K. K. (2013) Composite Structured Jute-Based Geo-textiles for River-bank Protection- Case Studies, Page No. 99-114.
- Bhaduri, S. K. & Basak, M. K. (2013) Retting of Jute: Present Status and Future Perspectives, Page No. 15-28.
- Chattopadhyay, S. N. (2013) Dyeing of Jute Fabric with Different Class of Dyes, Page No. 65-86.
- Debnath, S. (2013) Jute-Based Warm Fabrics, Page No. 87-98.
- Dey, S. K. (2013) Processing Technology for the Utilization of Pineapple Leaf Fibre (PALF) - An Agro-Waste, Page No. 239-250.
- Dey, S. K. (2013) Ramie Fibre: Extraction, Properties and Processing, Page No. 251-264.
- Ganguly, P. K. (2013) Natural Fibres Reinforced Polymeric Composites: Some Basic Considerations, Page No. 175-202.
- Ganguly, P. K. (2013) Particle Board: Science & Technology of Production, Page No. 283-314.
- Mishra, L. & Basu, G. (2013) Coconut Fibre - A Journey from Food to Fibre, Page No. 335-348.
- Nayak, L. K., Banik, S., Ammayappan, L. & Ray, D. P. (2013) Biomass Energy from Jute, Page No. 329-334.
- Pan, N. C. (2013) Bleaching of Jute, Page No. 55-64.
- Roy, A. K. (2013) Handmade Paper from Jute and Allied Fibres, Page No. 225-238.
- Roy, A. N. & Basu, G. (2013) Scope of Handloom for Jute Diversification and Development of Handloom for Jute Weaving, Page No. 265-272.
- Roy, A. N. (2013) Production, Processing and Utilization of Banana Fibre, Page No. 273-282.
- Roy, A. N. and Basu, G (2013) Blending of Jute with Different Fibres for Product Diversification, Page No. 41-54.
- Roy, G. (2013) Measurement & Process Control Systems of Jute and Allied Fibres, Page No. 151-174.
- Saha, B & Nag, D. (2013) Effect of Geo-textile Mulch on Rhizosphere,Root Growth, soil Physical Properties and Yield Attributes of Horticultural Crops, Page No. 115-120.
- Satapathy, K. K. (2013) Jute and allied Fibre Technology - A Perspective, Page No. 1-14.
- Sengupta, S.(2013) Jute Based mechanically Bonded Non-woven Fabrics - Production, Properties & Uses, Page No. 121-150.

- A book entitled : "Journey in Research for 75 Years" edited by Dr. K. K. Satapathy and compiled by Dr. S. N. Chattopadhyay, Dr. S. Sengupta and Dr. N. C. Pan (2013).
- A book entitled "Glossary of Jute to Fabric" by Dr. S. K. Dey and Dr. K. K. Satapathy (2013).

- A book entitled "Organic agriculture and role of microorganisms in agriculture (In Bengali)" by Dr. S. Banik (2012) published by West Bengal State Book Board. P.226.
- A book entitled "Smritir Aloyay NIRJAFT" by Dr. K. K. Satapathy, Shri Rajeev Lal, Dr. Debaprasad Ray, Shri Lilamoy Patra, Shri Koushik Mitra and Shri Ram Dayal Sharma (2013) pp 128.

Technical Bulletin/Mannual/Souvenir

- In the search of potentiality of coconut fibre -authored by G. Basu, L. Mishra, Sk Md J. Abbas, R. Chakraborty, and K. K. Satapathy, Souvenir of Annual Reunion, Institute of Jute Technology, Kolkata, 2013, 31-40.
- Geo-textiles sample display card - film covered window type display on A-4 size hard paper-board frame, both side vision, 4-colour, imprinted with logo and mentioning characteristic feature of the materials for more than 20 different samples developed/produced by NIRJAFT - a marketing/extension aid designed and prepared by L. Mishra & G. Basu.
- A training manual on "The art of making jute bags" authored by Roy A. K., Pan N. C. & Chattopadhyay S. N.
- A technical bulletin on "Evaluation of jute and its value added products" authored by Roy A. K., Pan N. C., Chattopadhyay S. N. & Ammayappan L.

Popular Article

- Nayak, L.K., Das, S. and Nag, D. Energy from Jute Biomass: Present status and future perspectives. COMSOMATH: A Magazine on Computer Science, Social Science and Mathematics (2012), Vol. 15 (2): 10-18.
- Nayak, L.K., Das, S. and Shambhu, V.B. Utilization of some leaf and bast natural fibres for socio economic development. COMSOMATH: A Magazine on Computer Science, Social Science and Mathematics (2013), Vol. 16 (1): 17-21.
- Sharma, R.D. & Ahirwar, K.L., Naisargik Resho ka Adhunik Bikas, Swarnima (Koltolic) 2012, P 38-40.

Handbook & Leaflet

- "Banana Fibre - Extraction and Utilization" in Hindi Language.
- Leaflet on Electronic Moisture Meter.

Paper Reviewed

- Banik, S., (2012) Evaluation of locally available substrates for cultivation of oyster mushroom *(leurotus ostreatus)*, *African Journal of Microbiology*.
- Banik, S., (2013) Influence of crop residue and earthworm species on quality and decomposition rate of vermicompost, *International Journal of Agricultural Sciences*.
- Banik, S., (2013) Evaluation of nutritive value of sugarcane bagasse fermented with chicken manure, *British Journal of Agricultural Science & Technology*.
- Banik, S., (2013) Advances in jute and allied fibres post-harvest processing technologies in Bangladesh : Adoption constraints, Prospect and Future Thrust, *Journal of Scientific Research*.

Library

NIRJAFT library has a holding of about 18,300 books. It subscribes to 55 nos. of Indian journals and 14 nos. of Foreign journals. It is a member of CeRa (Consortium e-resources in agriculture). It contains 2000 + e-journals in agricultural sciences. Besides that the Library subscribes to e-journals "World Textile Abstract" and "Journal of Industrial Textile". Library section renders reference services, photocopy services, current awareness services and abstracting services to fulfill 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 organizations by mailing annual reports, newsletters, misc. reports and Institute's publications in a regular frequency and receive the same from different Institutes. Dr. S. Ayyappan, Director General, ICAR, visited the library during the period under report.

One-day workshop on "Library automation: Impact on dissemination of scholarly output of a R&D organization"

Three skilled workers have been appointed in contractual basis during the period for six months from Nov., 2012 to May, 2013. They made entries in the computer and bar coded library books (Approx. 3000 Nos.) and the process is continuing till date.

Interaction among the expert in the field of library sciences during the workshop

One-day library workshop based on the theme "Library automation: Impact on dissemination of scholarly output of a R & D organization" has been organized with the help of Library Committee on 28.9.2012. Few experts in the field of Library and Information Sciences from different institutes delivered lectures. On the basis of their presentation and interaction a guide line has been drawn to improve the library system.

PME Cell

PME cell of NIRJAFT comprises of one principal scientist, three technical officers and two RAs. The PME, under close supervision of research manager, participates in various research planning and resource allocation mechanism, organization of research in system perspective, inviting peer reviews from experts and keeping accountability of the institute's projects, development of capacities in frontier areas of research, and decentralization of management functions and powers. Besides, PME conducts IRC, RAC and other meetings, publishing Annual Report, Newsletters, brochures, etc. Apart from that, it coordinates the orientation trainings for the newly joined ARS scientists. PME also prepares and delivers the replies to numerous queries sought by the ICAR and the parliament.

DDM Section

The Design Development & Maintenance Section (DDM) is at the centre of infrastructure development works in the Institute. This section provides monitors and maintains crucial support services for R & D

work in different Divisions & Laboratories in the form of civil, electrical, mechanical works, sanitation & transport services. This section has been the centre stage in planning, coordinating & execution of some major infrastructure developments in the Institute. Re-orientation of the main approach way of the Institute, beautification of front façade of CT Bldg with ICAR & Institute name & logo, revamping of the entire Administrative Block with furniture for a sleek & elegant décor and development of gardens are just some of the feathers in the cap of the DDM Section.

The DDM Section is also responsible for R & D work with regard to the development of the NIRJAFT Power Ribboner, Jute Decorticator to make them robust, portable and farmer-friendly. Different jute grading instruments like Fibre Strength Tester, Air Flow Fineness Tester, Colour & Lustre Meter and Bulk Density Meter, which were developed by the Institute, are fabricated in the DDM Section, which is the only source of availability of these instruments in India. These instruments are fabricated and supplied on order basis to different organizations.

This section is also an active partner in intra-Institutional and research activity, collaboration with QEI & TOT Divisions for development and refinement of Post Harvest Technology.

Quality Assurance Section

Quality Assurance Section is under Quality Evaluation & Improvement Division. The section has been doing regular physical tests as a part of many research projects initiated in NIRJAFT. The institute is having suitable infrastructure for short training programme on jute grading. Expert officers of the section have been participating in various jute grading camps organized by Agricultural Marketing Department, Government of West Bengal. Training is imparted through lecture and demonstration. 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 is also engaged in research project on different fibres grading system and process. Testing of jute, mesta, ramie, etc. samples received from outside agencies on payment basis is being done by the section regularly. A good number of outside parties have been availing of the testing facilities of this section.

Hindi Cell

Four Hindi Training-cum-Workshop were organized on 19.05.2012, 21.07.2012, 17.11.12 and 23.02.2013 to promote the fluency in use of Hindi language in the official work. During the workshop the staff member were trained in Hindi for official noting and drafting. Sri R. D. Sharma, Assistant Director (OL) delivered lecture on UNICODE ENCODING in a special workshop organized by ICAR at NIRJAFT, Kolkata and CIFA, Bhubaneswar during 10-11 September, 2012 and 04-05, October, 2012 respectively.

Four meetings of Official Language Implementation Committee were held on 30.06.2012, 29.09.2012, 31.12.2012 and on 30.03.2013 under the chairmanship of Dr. K.K. Satapathy, Director, NIRJAFT in which the progress of Hindi in official work was reviewed.

Hindi fortnight celebration was observed in the institute during 14-29 September, 2012. During this period Extempore competition for SS Staff, Debate Competition for Non-Hindi Employees, Quiz Competition for all Category, Hindi Noting & Drafting for Administrative Staff and Essay competition for all Category were organized in the Institute. Participants who acquired 1st, 2nd and 3rd position were awarded prizes and consolation prizes were distributed among the remaining participants. Hindi Fortnight closing celebration held on 29th September, 2012 under the chairmanship of Dr.K.K. Satapathy, Director, NIRJAFT. Colonel A.K. Mohanty, Colonel Education and Sri D.K. Rai, Assistant Director (OL) from Head Quarters Eastern Command, Fort William graced the occasion as Chief Guest and Guest of Honour respectively. Welcome address was given by Sri R.D. Sharma, Asstt. Director (O.L.). The programme was started with the opening song sung by Mr. Swapan Kr. Sinha, Assistant. Colonel A.K. Mohanty in his key speech suggested to use Hindi as a language of communication and said that Hindi is not only our Official Language but it is our identity. Sri D.K. Rai in his speech said that Hindi is only the language which is spoken and learnt by major portion of our country so only Hindi can be the Official Language of our country. Sri Rajeev Lal, CAO said that Hindi is our pridge so it is our constitutional duty to give respect and implement it as Official Language. Director, NIRJAFT, Dr.K.K. Satapathy in his presidential address said that Official Language Hindi has importance as our National Flag and National Song. He also 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. The programme ended with a resolution for making full efforts to increase the use of Hindi in administration and research work. Sri K.L. Ahirwar, Technical Officer (T-5) offered a vote of thanks at the end of the programme.

Article published : Ahirwar, K.L., Vishwa main Jute, Bikshan 2013, P 83-85.

Distinguished Visitors



- Dr S Ayyappan, Secretary, DARE, Govt. of India & DG , ICAR, New Delhi.
- Dr. Subrata Gupta, Jute Commissioner, Min. of Textile, Govt. of India.
- Mrs Arti Kanwar, Deputy Jute Commissioner, Min of Textile, Govt. of India
- Dr Anubrata Das, NRCP, Ex-Director.
- Prof. Amitabha Chatterjee, Ex HOD, (Library & Information Science).
- Dr. Arun Chakrabarty, Chief Librarian, Bose Institute .
- Satyanarayan Panigrahi, GM, ONGC.
- AK Patra, Deputy Manager, ONGC.
- Mahadeb Deb, Sr. F&AO, ONGC.
- Dr M M Pandey, DDG (Engg), ICAR, New Delhi.
- Dr. Swapan Dutta, DDG (Crops), ICAR, New Delhi.
- Dr Bangali Baboo, National Director, NAIP, ICAR, New Delhi.
- Dr S Mauria, ADG (IP&TM), ICAR, New Delhi.
- Dr S P Pandey, National Co-ordinator, NAIP-I, ICAR, New Delhi.
- Dr V N Sharda, Member, ASRB, New Delhi
- Dr. B. S. Mahapatra, Director, CRIJAF, ICAR, Barrackpore.
- Mrs Anita Agnihotri, Additional Secretary & Financial Advisor, Min of Textile, Govt. of India



Research & Development Programme 2012-2013

Quality Evaluation & Improvement Division

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
QEI - 4	Standardization of fungal retting by dry fermentation procedure for water economy	Dr. S. Banik	April 2010	September 2013
QEI - 6	Development of a PLC based process control system for jute industries	Dr. G. Roy	September 2010	August 2012
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

Mechanical Processing Division

MP - 1	Development of natural fibre-based geo-textiles and placement system for protection of river-bank and improvement of soil stabilization	Dr. G. Basu	April 2010	September 2012
MP - 2	Enhancing the figuring capacity of developed handloom and study of its weaving performance for speciality fabric production and product development therefrom	Dr. A. N. Roy	April 2010	March 2013

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
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 2013
MP - 5	Modification of jute spinning machinery	Dr. S. Debnath	April 2010	March 2013
MP - 7	Study on bending, frictional and electrical behaviour of jute materials	Dr. S. Sengupta	April 2010	March 2014
	Chemical & Biochemical Processing Division			
CBP - 1	A comparative study of different pulping methods on jute and allied fibres for making value added handmade paper	Dr. A. K. Roy	April 2010	March 2013
CBP - 4	Dyeing of jute fabric using natural dyes with improved fastness properties	Dr. S. N. Chattopadhyay	April 2010	March 2013
CBP - 5	Application of biotechnology in the colouration of jute fabric	Dr. N. C. Pan	April 2010	March 2013
CBP - 6	Energy from jute and agro-residue biomass	Dr. L. K. Nayak	April 2010	March 2013
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 bio-adhesives 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 nano-particles	Dr. L. Ammayappan	October 2012	September 2015

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
	Transfer of Technology Division			
TOT - 2	Analysis of information dissemination techniques in transfer of jute and allied fibre technology through training, exhibitions and demonstration for rural development	Dr. U. Sen	April 2010	March 2013
TOT - 4	Environmental impact analysis of jute and jute products in view of carbon balance	Dr. B. Saha	October 2010	September 2013
TOT - 5	Development of an extractor to produce good quality banana fibre for textile use	Dr. L. K. Nayak	April 2012	March 2014
TOT - 6	Design and development of a commercial extractor for PALF	Dr. D. Nag	October 2012	March 2014
TOT - 7	Studies on techno-economic constraints and opportunity of jute diversified products manufacturing	Dr. S. B. Roy	October 2012	March 2014
TOT - 8	Development of suitable expert system for analysis of defects of jute fabrics during inspection	Shri S. Das	May, 2012	March, 2015
	Sponsored Project/ Contract Research			
JTM-MM IV /7.1/5	Development of low cost dense jute non-woven fabric	Dr. S. Sengupta	May 2010	March 2013
NJB/ MM-IV/ 6.2	Development of electronic and microprocessor based integrated instrumentation for jute grading system	Dr. G. Roy	April 2011	March 2013
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

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
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
NFBS FARA-FQ -3029	Jute based bio-composites for industry	Dr. P. K. Ganguly	July 2012	June 2015
NFBS FARA-FQ -3030	Understanding genetics and biosynthesis of gum in ramie (*Boehmeria nivea* L. Gaud.) for developing low-gum genotypes	Dr. P. Satya, CRIJAF, ICAR Dr. D. P. Ray NIRJAFT, ICAR	June 2012	May 2016
	NAIP Project			
NAIP, Component-1	Zonal Technology Management and Business Planning and Development (BPD) unit at NIRJAFT, Kolkata	Dr. D. Nag	June 2009	March 2014
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. Basu	November 2008	December 2013
NAIP, Component-III	Sustainable rural livelihood empowerment project for northern disadvantaged districts of West Bengal	Dr. S. Debnath	April 2008	December 2013

Personnel

Up to 31.03.2013

Dr. K. K. Satapathy	M .Tech., Ph.D.	Director

Quality Evaluation & Improvement Division

Dr. Gautam Roy	MEE, Ph.D.	Pr. Scientist & Head of Divn.
Dr. S. Banik	M.Sc. (Agri.), Ph.D.	Pr. Scientist
Dr. D. P. Ray	MSc., PhD	Sr. Scientist
Dr. V. B. Shambhu	M. Tech., Ph.D.	Sr. Scientist
Dr. S. C. Saha	M. Sc. Ph.D.	T-7-8
Mrs. Rina Nandi	B.Sc. (Hons.), B.A.	T-6
Sh. H. Sengupta	Dip. in Text..Tech.	T-6
Sh. P. Majumdar	B. Sc.	T-6 (Retired on 31/10/2012)
Sh. S. B. Mondal	B.Sc., B.Ed.	T-6
Sh. Arindom Ghosh	B.Sc.	T-6
Sh. N. Paik	SF, ITI	T-5

Chemical & Bio-Chemical Processing Division

Dr. A. K. Roy	M.Sc., Ph. D.	Pr. Scientist & Head of Divn.
Dr. P. K. Ganguly	M. Tech., Ph. D.	Principal Scientist & I/C, PME
Dr. S. N. Chattopadhyay	M. Tech., Ph.D.	Pr. Scientist
Dr. N. C. Pan	M. Tech., Ph. D.	Pr. Scientist
Dr. L. Ammayappan	M. Sc., Ph .D	Sr. Scientist
Sh. K. Patra	H.S. Dip. in Elec. Engg.	T-5
Sh. Amalesh Khan	B.Sc.	T-5
Sh. Pradip Talukder	SF	T-5

Mechanical Processing Division

Dr. Gautam Basu	M. Tech. Ph. D .(Tech.) FIE (I), PGDJT	Pr. Scientist, Head of Divn, Vigilance Officer & I/C DDM Section (3.1.2013)
Dr. S. Sengupta	M. Tech. Ph. D. C. Engg.(I) FIE, PGDFM	Pr. Scientist
Dr. A. N. Roy	M. Tech., Ph. D.	Pr. Scientist
Dr. Sanjoy Debnath	M. Tech., Ph. D.	Sr. Scientist
Sh. Nilamani Kundu	M. Tech	Scientist Resigned on 23/02/2013
Sh. P. Y. Verma	M. Tech	Scientist Resigned on 24/12/2012
Dr. S. K. Dey	M. Tech., Ph.D.	T-7-8
Sh, Prakash Singh	Mechanical Engg.	T-5

Transfer of Technology Division

Dr. D. Nag	M. Tech. Ph.D.	Pr. Scientist & Head of Divn.(Actg.)
Dr. Biplab Saha	M.Sc., Ph. D.	Pr. Scientist

Dr. S. B. Roy	M.Sc., Ph.D.	Sr. Scientist
Dr. L. K. Nayek	M. Tech., Ph. D.	Scientist
Sh. Sujai Das	M.Sc. (Computer Sc.)	Scientist (Sr. Scale)
Sh. K. Mitra	B.A. (Hons.)	T-5
Sh. T. K. Ghosh	B.Sc.	T-5
Smt. Riva Ghosh	H.S. ,Diploma in Computer Application	Telephone Operator (T-5)

Design, Development & Maintenance Section

Dr. P. K. Ganguly	M. Tech., Ph. D.	Principal Scientist & I/C, DDM up to 14/01/213
Dr. Gautam Basu	M. Tech. Ph.D. Tech.)	Pr. Scientist & Head of Divn., I/C wef 15/01/2013
Sh. L. M. Patra	H.S., Dip. in Elec. Engg.	T(7-8)
Sh. P. Sanyal	B.Sc. In Agril. Engg.	T-6
Sh. Prabin Chowdhury	SF, ITI	T-5
Sh. L. Mondal	Classs VIII pass	T-5 (Driver)
Sh. Chanchal Kundu	H. S, Dip in Mech. Engg	T-5

PME Cell

Dr. M. K. Basak	M. Sc. Ph. D.	I/C Principal Scientist retired on superannuation on 31/12/2012
Dr. P. K. Ganguly	M. Tech., Ph .D.	Principal Scientist, I/C & PIO, w.e.f. 23/01/2013
Dr. Utpal Sen	M.Sc., Ph.D.	T (7-8)
Smt. P. R. Ghatak	B.Sc.	T (7-8)
Dr. Debabrata Das	M.Sc., (Ag.), Ph. D	T-5 (Joined on 06/03/2013)

Library

Dr. R. Naiya	B.Sc. .B. Lib, Ph. D	T-5 I/C Library

Administration

Sh. Rajeev Lal	B.Sc. Hons. (Physics)	CAO
Smt. Anasua Majumder	M.Sc.,	AF& AO
Sh. B. Kabi	B.Com.	Assistant Adm. Officer, (Adm.I)
Lipika Ghosh	P.U.	Assistant Adm. Officer, (Adm.II)
Sh.Swapan Chakraborty	B.Com.	Assistant Adm. Officer (Stores)
Sh. M. M. Pal	B. Com.	Assistant Adm. Officer, F&A Sec retired on superannuation31.01.2013
Sh. Balaram Chatterjee	B.Com.	PS to Director

Hindi Cell

Sh. R. D. Sharma	MA, DHT, PGDT	AD (OL) I/C Hihdi Cell
Sh. K. L. Ahirwar	MA	T-5

Financial

A. The budget provision and actual utilization under Plan, Non Plan, NAIP, (Funded by World Bank) & Plan Schemes during 2012-13

(Amounts in Lakhs)

Sl. No.	Name of Heads	Opening Balance	Fund Received	Actual Utilization	Closing Balance
1.	Non-Plan	1.34888	1238.30	1233.26093	6.38795
2.	Plan	0.00333	328.00	327.131	0.87233
3.	NAIP Projects	63.31	34.46	58.97	0.75
4.	Plan Schemes (I.T.M.U & ZTMC)	3.06	19.20	18.16	4.11

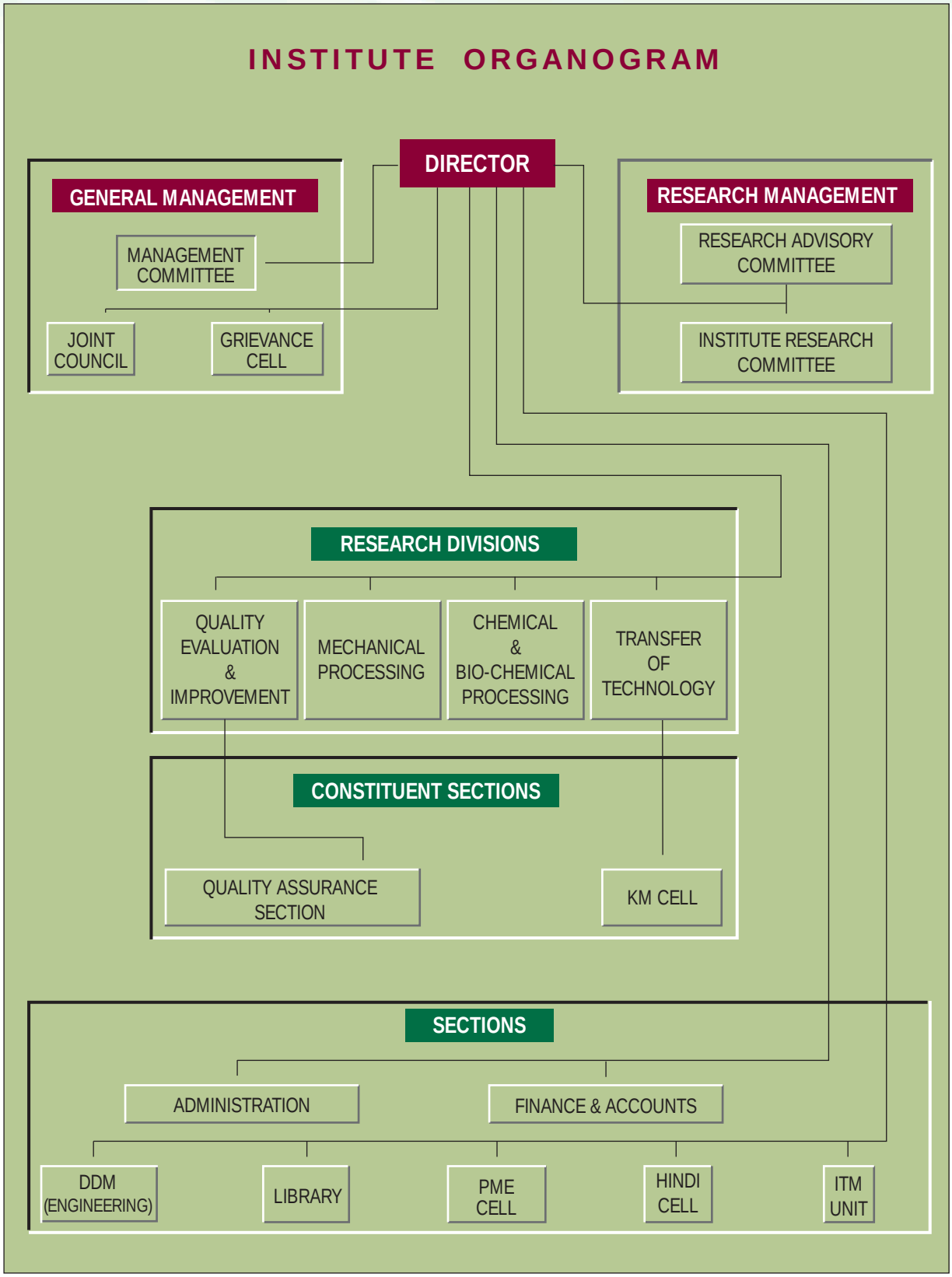
Note : *Rs. 38.0421 of NAIP fund was refunded to ICAR*

B. Sub-head wise budget provision and actual utilization under Institute Plan and Non Plan Schemes during 2012-13

(Amounts in Lakhs)

Sl. No.	Sub-Head	Plan		Non Plan	
		Budget Provision	Actual Utilization	Budget Provision	Actual Utilization
A)	**Revenue Expenditure**				
1.	Establishment Expenses	–	–	846.50	846.31
2.	Pension & Other Retirement Benefits	–	–	300.00	294.20
3.	Travelling Allowances	12.00	11.99662	4.00	4.00
4.	Research & Operational Exp.	65.00	64.97041	8.00	7.98
5.	Administrative Expenses	120.00	119.27544	75.00	74.64
6.	Miscellaneous Expenses	52.00	51.92227	4.95	4.96
	Total of A	**249.00**	**248.16**	**1238.45**	**1232.09**
B)	**Capital Expenditure**				
1.	Equipment	–	–	4.00	3.97
2.	Works	37.00	36.96	–	–
3.	Library Books & Journals	12.00	12.00	–	–
4.	Vehicles	-	-	-	-
5.	Furniture & Fixture	10.00	10.00	-	-
6.	Information Technology	20.00	20.00	–	–
	Total of B	**79.00**	**78.96**	**4.00**	**3.97**
Total (A+B)		**328.00**	**327.13**	**1242.45**	**1236.06**

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
website www.nirjaft.res.in