Annual Report 2014-15 ICAR-NIRJAFT

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NATIONAL INSTITUTE OF RESEARCH ON JUTE & ALLIED FIBRE TECHNOLOGY
(ISO 9001:2008)

ANNUAL REPORT

2014-2015

ICAR - NATIONAL INSTITUTE OF RESEARCH ON JUTE AND ALLIED FIBRE TECHNOLOGY
(ISO 9001 : 2008)

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Foreword

As a multidisciplinary organisation and in line with its mandate, the institute is tasked with generating new knowledge, applying existing knowledge, developing technologies and leveraging these to make a positive socio-economic impact. As such, it continued to respond to the national priorities relating to diversified products development, improving the quality of fibre by world-class research, technology and innovation outputs; and contributing to the overall competitiveness in the country. I am pleased to report that good progress has been made in this regard. Engagement with stakeholders and thorough assessment of the organisation's competencies resulted in the firming up of a strong developmenal module. With the environmental crisis deepening and climate change impacts being felt across the globe, our work in 2014-15 has proven increasingly more challenging and demanding. We have, however, completed remarkable work, executed groundbreaking campaigns, and secured accolades from the natural fibre community.

Most remarkable achievement made by the institute for the cause of natural fibres was collaborating with The Indian Natural Fibre Society (TINFS) in organizing an International Conference on Natural Fibres (Theme : Jute and Allied Fibrs)at Kolkata on Aug. 1-3, 2014, which was inaugurated by Hon'ble President of India, His Excellency Sri Pranab Mukherjee on 1st. Aug., 2014. The main goal of the International Seminar on Natural Fibres was to raise the profile of these fibers and to emphasise their value to consumers while helping to sustain the incomes of the farmers. In addition, the International Seminar 's objective was also to promote publicity of the efficiency and sustainability of the natural fiber production, encourage appropriate policy responses from governments to the problems faced by natural fiber industries and foster an effective and enduring international partnership among the various natural fiber industries.

The institute will continue to provide focus to its high impact research and technologies, backed by an imperative to remain committed to human capital/resource development which will ask for innovative research and skills management, optimal leveraging of strategic alliances and continuous engagement with all its stakeholders.

Debasis Nag

(Dr. Debasis Nag)
Director, NIRJAFT

SUMMARY

NIRJAFT, a premier institute of post harvest research of jute and allied fibres has developed nineteen new products or processes in the reporting year, some of them have enough potential for commercialisation to serve entrepreneurs, industries and farmers. Utilisation of agrowaste, advanced fibre extraction, fibre and fabric evaluation, utilisation of lesser known fibres, processing for new/eco-friendly products and nano finishing are addressed by the developed technologies. Following number of projects are carried out during 2014-15 and completed, extended & added at the end of this year.

Division	Number of projects			
	Carried out	Completed	Extended	Started
Quality Evaluation and Improvement (QEI) Division	6	3	1	0
Mechanical Processing (MP) Division	6	0	1	0
Chemical and Biochemical Processing (CBP) Division	5	1	0	1
Transfer of Technology (TOT) Division	3	0	0	0
External Sponsored Projects*	5	2	1	0
Total	25	6	3	1

(*The projects are sponsored by Department of Science and Technology, Govt. of India; National Funds for Basic Strategic and Frontier Application Research in Agriculture, ICAR and National Jute Board, Govt. of India.)

- One patent was granted and three patents were filed during this period.
- Two MOU and four MOA were signed with external agencies.
- In the reporting year, thirty research papers, six books and several other documents were published.
- Scientists of the institute are regularly presenting their research output in the national and international forum as well as in the institute for dissemination and feedback by the experts. During 2014-15, research paper presented in seminars/conferences were sixty two whereas in-house presentations were twenty two.
- The institute has organised thirty two training programmes on different aspects of jute & allied fibres, twenty five front line demonstrations on retting technology and participated in three exhibitions.

- The institute has successfully organised an International Conference on Natural Fibres (Theme: Jute & Allied Fibres) which was inaugurated by Hon'ble President of India in presence of The Director General, ICAR; The Governor, Govt. of WB; The Jute Commissiner, Govt of India and The Chairman, IJMA.
- Institute also organised eighteen programmes including three memorial lectures, two institute-industry-interface workshops for four NIRJAFT technologies, two brain storming sessions by innovation cell.
- One IMC meeting, one GC meeting, two IJC meeting, one RAC meeting, one PMEC meeting, two IRC meeting and four ITMC meeting were held during 2014-15.
- The institute is running as per the norms of ISO 9001:2008.
- FMS-MIS has been successfully implemented from Nov., 2014.
- One young scientist has been awarded The Jawahar Lal Neheru medal from ICAR for outstanding research.
- The institute budget was Rs. 2,82,12,578/- (Plan) and Rs. 13,91,42,269/- (Non-plan), out of which the actual expenditure was Rs. 2,79,25,721/-(Plan) and Rs. 13,31,91,606/- (Non-plan). Resource Generation of the institute was Rs. 46.20 Lakhs. Money received from external projects was Rs. 73.84 Lakhs.
- All the approved civil and electrical works has been completed. Institute has procured ten instruments to support the research.

INSTITUTE

The institute was formerly known as Jute Technological Research Laboratory (JTRL) and was set up by the Indian Central Jute Committee, Government of India on the recommendation of the Royal Commission on Agriculture in 1936 at Calcutta. The institution was officially established on January 3, 1939 by Lord Linlithgow, the then Viceroy and Governor-General of India. In 1965, it became a constituent unit under the centralized administrative control of the Indian Council of Agricultural Research (ICAR), New Delhi and has been renamed as the National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT) on 1996, to carry out basic and applied researches related to post harvest processes of jute and allied fibres such as mesta, linseed/flax, sisal, ramie, banana, sunnhemp, pineapple leaf, dhaincha, coconut fibre and other lesser known long vegetable fibres. NIRJAFT is also committed to pursuit the knowledge transfer and economic development activities that benefit the local, regional and national constituents.

The institute is located on the southern fringe of Kolkata, known as Tollygunge, with a total plot area around 17,628 sqm. During last seven decades, the institute was flourished with multifarious disciplines and carved a niche as a centre of excellence for research on jute and allied fibres catering to the entrepreneurs and industry. The institute is adequately equipped with the state of the art laboratories having sophisticated tools, instruments and processing machinery.

Mandate

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

The administration is headed by the Director and he manages the system with the help of Management Committee, Joint Council and Grievance Cell. The R & D is being managed by Research Advisory Committee and Institute Research Committee. The R&D programmes of the institute is implemented through the following four divisions, three ancillary sections and library.

Quality Evaluation and Improvement (QEI) Division:

The division is engaged in research on fibre extraction, evaluation, quality assurance and grading. Up gradation of quality, evaluation of physiochemical properties, chemical modification of jute and allied fibres are the major contribution of this division including extraction of useful chemicals from agricultural by-products of fibre crops.

Mechanical Processing (MP) Division:

The division carries out basic and applied research on mechanical processing, quality control and product development from ligno-cellulosic & long vegetable fibres. Improvement of process, productivity & product quality; design & development of product, machinary & instrument; quality assessment on geotextile, agrotextile, apparel, packaging, automotive and industrial textiles are the main areas of research of this division.

Chemical and Biochemical Processing (CBP) Division:

The division is exclusively working on chemical/ biochemical processing, quality control and product development from ligno-cellulosic & long vegetable fibres. It has major contribution on pulp & paper; bleaching, dyeing & finishing; particle & fibre board; composites from jute and allied fibres. Nano technology and biomass utilization are also important areas where scientists of this division are working.

Transfer of Technology (TOT) Division:

The mandate of this division is to transfer institute's technologies, develop entrepreneurship providing technical training and capacity building, arrange front line demonstrations and participate in different exhibitions, fairs, melas etc for promoting the developed technologies. It is also developing the project profile of viable technologies and rendering technical assistance for incubators.

Design, Development and Maintenance (DDM) Section:

The objective of the section is to assist in design and development or modification of machinery/prototype, equipment, instruments etc. for institutional purposes. It is also engaged in customary maintenance of machines and instruments; civil & electrical infrastructure of campus; security aspects; new infrastructure building activities; monitoring of car etc.

Quality Assurance (QA) Section

This section deals with evaluation of fibre quality and grading of jute and allied fibres. It is associated with CRIJAF in All India Network Project (AINP) for jute and mesta. The section coordinates the system for acquiring and maintenance of ISO certification of the institute.

Priority setting, Monitoring & Evaluation (PME) Cell:

The PME cell helps in designing and monitoring the R&D programs of the institute. It is responsible for convening meetings of the Staff Research Council, Research Advisory Committee, in-house lectures and compiling the monthly, quarterly, half-yearly and annual technical reports of the institute. This unit also coordinates in technical inquiries from the council as well as Parliament questions from time to time.

Library:

It acts as a centre of repository for scientific and technological information of jute & allied fibres including other ancillary disciplines by maintaining a large number of books, journals, reports, reprints, pamphlets. the library has developed suitable infrastructure for computerized operation.

Staff position as on 31.03.2015

Category	Sanctioned posts	Posts filled	Posts vacant
RMP	01	01	00
Scientific	44	21	23
Technical	60	51	09
Administrative	35	24	11
Supporting	41	27	14
Auxiliary	04	04	00
Total	**185**	**128**	**56**

The institute has efficient administrative section under guidance of The Director to support the research and dissemination activities. It also contains well managed guest house called scientists' home, trainees' hostel and farmers' hostel. It is also equipped with auditorium, conference hall, conference room and meeting room to organise seminar, meetings and other programmes regularly.

A GLANCE

New products/process developed

- Dhaincha gum has been successfully used as thickener for sizing of textile materials.
- Jute seed oil / extracts has been used as a bio-pesticide.
- An up-graded pineapple leaf fibre extractor with the provision of combing roller, two serration rollers and improved delivery mechanism was designed and fabricated
- Two types of jute colour meters i.e. low cost handy type and laboratory type, have been designed and developed.
- Fabric electrical insulation tester has been designed and developed.
- A motorized fabric inspection table has been designed and fabricated.
- Eco-friendly water miscible jute conditioning agent has been developed.
- Good quality handmade paper has been developed by sequential bio-treatment on jute or sunnhemp.
- Particle board has been developed from coconut stem particles using 12% hydrolysed lac as bio-adhesive.
- Printing with natural dyes on bleached jute fabric has been developed.
- Sanitary napkins has been developed from bleached jute.
- Water repellent property of jute fabric has been developed by treatment with Nano SiO_2.
- Washing fastness of jute fabric has been improved by treatment with Nano Ag.
- Fancy jute covered yarn/mat stick based ornamental fabric were developed.

- Electronic and microprocessor based integrated instrument for jute grading has been designed and developed.
- Computerized instrument to test bending behaviour of technical textiles with acceptable accuracy has been developed.
- A low cost and user-friendly yarn characterization unit has been developed using opto-sensor and image processing unit.
- A microbial culture have been isolated from the local soil and purified for degumming of Ramie.
- Nano-polysiloxane coupling agent, Low Molecular Weight Compatibilizing agents and modified resin has been identified for improved properties and environmental stability of jute based biocomposites.

Patent : a) Granted: One, b) Filed: Three

Training/workshop organized: Thirty two

Program organized:

- International Conference on Natural Fibres (Theme: Jute & Allied Fibres).

- In-house seminar- Twenty two
- Standing Advisory Committee (SAC) Meeting of ZTM-BPD Unit of NIRJAFT
- Brain storming session (Innovation lecture) on 'Jute diversified products', delivered by Shri D. C. Baheti, Executive Director, M/s Gloster jute mills limited.
- Brain storming session on 'Sustainability of Indian Jute Industries in the present circumstances of relaxation of JPMA' delivered by Shri Samir Kumar Chandra, Chief Executive (Works) and Director of M/s Hukum Chand Jute Mills of Hooghly Infrastructure Pvt. Ltd.
- An Awareness programme on ISO 9001:2008.
- Second C R Nodder Memorial Lecture delivered by Dr V Subramaniaum, Ex-Professor, Anna University, Chennai on "Thermal Conductivity of Fabrics".
- 77th Foundation Day Lecture by Dr.P. Chandra, Ex-ADG, ICAR, New Delhi.
- 4th Dr. P. B. Sarkar Memorial Lecture delivered by Dr. S. K. Sett, Ex Principal GCETT, Serampore, West Bengal on 'Production and characteristics of different fibres, their advantages and disadvantages'.

- Industry-Institute Interface Workshop on 'Newly developed low cost instruments for technical textiles'
- Industry-Institute Interface Workshop on 'Automatic Integrated Jute Grading System'
- An awareness lecture by Dr. A. Alam, Ex. DDG (Engg.), ICAR.
- Swach Bharat Mission activity by NIRJAFT employees.
- Workshop on 'A model library in the era of information technology'
- Vigilance Awareness Week celebrated.
- Four workshops on Hindi.
- Hindi Fortnight Celebration
- Rashtriya Ekta Diwas, (National Unity Day) celebration

Publication:

- Research papers: Thirty
- Book: Six
- Book chapter: Sixty four
- Technical bulletin/manual/report/leaflet/brochure: Thirty one
- Popular article: Sixty eight

Research paper presented in seminars/conferences : Sixty two

Memorandum of Understanding signed : Two

Memorandum of Agreement signed : Four

Front line demonstration : Twenty five

Awards : Three

Total composite score in performance evaluation report of RFD 2013-14 : 98.00

Resource Generation : Rs.46,20,007/-

Fund received from External Sponsored Projects : Rs 73,84,457/-

Instrument procured:

Centrifuge
Double distillation unit
Muffle furnace
Digital balance
Hot air oven
Digital pH meter
Moisture analyser
BOD Incubator
Vertical gel electrophores system
White Light Transilluminators

Infrastructure Development:

- Completion of the Institute Record room with installation of the Optimizer
- Footpath with paver's block near flag post
- False ceiling & roof slab of Instrument room QE&I Division
- Partition wall adjacent to Type-II Qtr. for protection
- Roof repair of Gas plant shed (QE&I Division)
- Providing shutter, false ceiling and glass door for Exhibit Display corner (TOT Division)
  Providing and fixing of bilingual steel lettering of Institutes name at Gate no.-1
- Bilingual display of ISO certification at Gate no.-2

Quality Evaluation & Improvement Division

Priority areas of research

- New and improved retting technologies
- Improved fibre extraction machineries
- User friendly grading system
- By-products and waste utilization through extraction of value added chemicals/ products
- Improved automation and portability of testing equipments for Ligno-cellulosic materials
- Life cycle analysis from fibre extraction to disposal

Achievements

- Dhaincha gum has been successfully used as thickener for sizing of textile materials.
- Jute seed oil/ extracts can be used as a bio-pesticide with suitable formulation for effective control of pathogenic fungi and agricultural insects.
- Banana fibre extractor has been upgraded by incorporation of an additional roller to avoid the backward dragging of pseudo-stems. The feeding has been modified to insert the whole pseudo-stem into the extractor for getting fibre of maximum length.
- An up-graded pineapple leaf fibre extractor with the provision of combing roller, two serration rollers and improved delivery mechanism was designed and fabricated.
- Two types of jute colour meters i.e. low cost handy type and laboratory type, have been designed and developed.

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

Dr. S. Banik & Dr. B. Saha

Demonstration of the technology was conducted in eleven different JCI centres of different jute growing districts of West Bengal (Table QEI 4.1) from NFSM fund for verification of experimental results. Farmers were convinced that it was the need of the hour and hassle free retting of jute was possible without polluting the environment during water scarcity. They desired that technology might be refined for more wide range of duration of jute crop i.e 90-120 days. They opined to develop a market chain for production and supply of the fungal cultures to the jute growers. Replacement of polythene wrapper with any suitable biodegradable sheet was also recommended. They wanted training of unemployed village youth / self help groups for production of the culture to increase accessibility of the cultures to the jute growers.

Table QEI 4.1. NFSM sponsored FLDs on fungal dry retting of jute at different centres of JCI

Serial No	Date	Place
1.	06.8.2014	Champadanga (Hooghly)
2.	07.8.2014	Bagda (North 24 Parganas)
3.	12.8.2014	Baduria (North 24 Parganas)
4.	13.8.2014	Haripal (Hooghly)
5.	18.8.2014	Bagjola (North 24 Parganas)
6.	23.8.2014	Bethuadahari (Nadia)
7.	26.8.2014	Berachampa (North 24 Parganas)
8.	27.8.2014	Jirat (Hooghly)
9.	27.8.2014	Kalna (Burdwan)
10.	04.9.2014	Nazirpur (Nadia)
11.	05.9.2014	Kaladanga (Murshidabad)

Figure QEI 4.1. Demonstration of fungal dry retting in farmers' field

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, Sh. S. B. Mondal & Sh. K. Manna

Jute and dhaincha seeds are rich source of phytochemicals which are being explored for the first time with this project. In our earlier reports extraction methodology of jute and dhaincha seed oil has been covered. The extraction of methanol soluble ingredients has been emancipated in our earlier study. The oil extracted from jute seed have found to be effective for processing of jute fibre and it has been demonstrated in repeated mill trial study. Accordingly, the findings have been protected by a patent (49/Kol/2014-15). During the present year of study, three important aspects have been covered viz., application of dhaicha gum as an adhesive for preparation of paper, use of gum for textile sizing and usefulness of jute seed extract/oil as a biopesticide.

Validation of Solvent extraction technology for dhaincha gum

Extensive trial runs were conducted on the validation of dhaincha gum through solvent extraction technology. Acetone was found to be the most suited solvent for extraction of dhaincha gum. The yield of gum through this method was 35-42%. The method was compared with the conventional method of extraction. It was found to be far superior as compare to the conventional milling method where the yield is around 15-25%.

Figure QEI 8.1: Solvent extraction of dhaincha gum

Figure QEI 8.2. Gum extracted from dhaincha

Characterization of Dhaincha gum through instrumental techniques

The gum isolated from dhaincha seeds are found to be galactomannan type and have been characterized through instrumental techniques. FT-IR and Mass Spectrometry (MS) study were conducted to confirm their structure and chain length. The gum was found to be as like as guar gum type.

Application of dhaincha gum for preparation of paper and studies of paper properties

Dhaincha gum extracted through milling method as well as solvent extraction technology was subjected to preparation of papers. Around 58 GSM paper was prepared in NIRJAFT CBP Division and characterized properly. However, the paper properties like folding endurance have been reduced due to application of

galactomannan type of gum. On the contrary the tear index and burst index of the paper has been found to be as comparable as with the standard one.

Figure QEI 8.3. Pulping of jute using dhaincha gum as a binder

Figure QEI 8.4. Paper sample made up of jute fibre using dhaincha gum

Application of dhaincha gum for textile sizing

Dhaincha gum extracted from the seed through both the techniques has been used for the sizing of clothes. The basic treatments for the sizing experiments were:

- Sizing of textile using Dhaincha Gum only
- Sizing of textile using Khoi only
- Sizing of textile using mixture of Khoi & Dhaincha Gum
- Control fabric.

The results revealed that the gum alone or in combination with different ratios of conventional Khoi + lime was giving very positive results indicating that the gum can be explored for the textile sizing purpose.

Fig QEI 8.5 Sizing of textile using Dhaincha Gum only

Fig QEI 8.6 Sizing of textile using using Khoi only

Fig QEI 8.7 Sizing of textile using mixture of Khoi & Dhaincha Gum

Fig QEI 8.8 Control Fabric

Characterization of jute seed oil and methanolic extracts

The jute seed oil and the methanolic extracts from jute seed were characterized chemically. The fatty acids were identified and characterized through GC-MS after suitable derivatization.

Extraction of purified cardinoloid type of compounds from jute

From the methanolic extracts some pure crystals have been isolated and purified. These compounds were found cardinoloid type of compounds through the instrumental analysis. This is a first time reporting of cardinoloid type of compounds. These compounds are extracted in suitable proportion and important lead molecule can be isolated from the waste jute seed.

Application of jute seed as biopesticide

Jute seed oil and the methanolic extracts were found to have antifungal properties when applied against the soil fungi *Rhizotonia solani and Sclerotium rolsii.*

Insecticidal properties of the seed extracts were carried out against an agricultural pest Bihar hairy caterpillar (*Spilosoma obliqua*) . The extracts were controlled around 90% Bihar hairy caterpillar in 3rd instar larvae. Thus the jute seed extracts can be used as biopesticide and further work in this area is necessary for field evaluation with proper formulation.

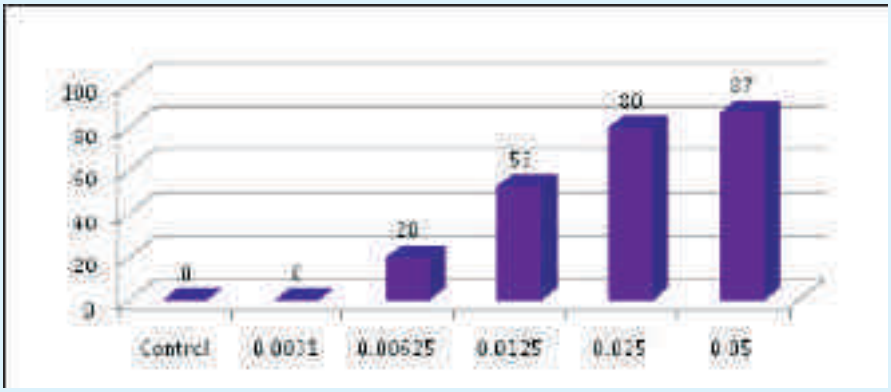


Figure QEI 8,9 Mortality of third istar larvae of Bihar hairy caterpillar

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

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

After harvesting of banana fruit, huge quantity (60 to 80 t/ha) of waste biomass (pseudo-stem. leaves, suckers etc.) is generated. Presently, this biomass is discarded as waste. Considerable work has been done in the field of direct use and product development from banana fruits. However, not much attention has been focused on effective utilization of the biomass. Textile grade fibre can be extracted from this pseudo-stem. Though banana fibre extractors have been designed and developed at various R&D institutes and commercial organizations of the country, no where the quality of fibre extracted from these machines matches the desirable properties of textile grade fibre in terms of fineness, strength etc., for making fine quality yarn. Moreover, the fibres obtained from these extractors differ in quality posing problem to the processor. Hence, design and development of an efficient extractor and standardization of the extraction process for getting good quality textile grade fibre is the need of the hour.

Extensive trial runs were conducted on the first up-graded extractor (with the provision of feeding mechanism & scratched roller-guide plate clearance adjustments) to study the variation of yield of fibre from green and white sheath of pseudo-stem. The fibre yields from green & white sheath were found to be 0.70% and 0.96% respectively. The overall yield of dry fibre from pseudo-stem was found to be 0.80%. The CAD designs of the second up-graded extractor (with the provision of an additional roller to avoid backward dragging & delivery mechanism) were completed.

Figure QEI 12.1. Inside view of banana fibre extractor

Figure QEI 12.2. Demonstration of banana fibre extractor

QEI 13 Design and development of a commercial extractor for PALF

Dr. L.K. Nayak & Dr. S. Banik

The process of fibre extraction from the pineapple leaf can be done either manually or by machines. The manual process involves stripping off the fibre from the retted leaf. In this method, a lot of fibre is lost and the entire process is also very laborious. In the mechanical process, the soft green parts of the leaves are crushed in a raspador machine and then washed in water to get the fibre. Automatic and semi-automatic machines developed by R&D institutes and commercial organizations are not suitable for operation in case of small holdings as prevalent in Eastern, North-Eastern and Southern parts of the country growing pineapple. Therefore, it is proposed to design and develop a machine for efficient extraction of uniform and quality fibre with the standardization of the retting process.

During trial run on first up-graded extractor, it was observed that the scrapping and serration on green leaves is not adequate for retting. Though the wax layer present on leaves surface is scrapped and cut into small pieces; yet not removed from it resulting an improper action of serration roller. The CAD designs of the second up-graded extractor (with the provision of two scrapping roller & one combing roller along with delivery mechanism) were completed.

Figure QEI 13.1. Inside view of PALF fibre extractor

Figure QEI 13.2. Demonstration of PALF fibre extractor

QEI 15 Performance analysis of crop specific agro-textiles

Dr. B. Saha, Dr. S. Debnath, Dr. S. B. Roy & Dr. D. Das

The project has been taken up in the three different agro-climatic zones of West Bengal in Nadia, Birbhum and South 24 Parganas district of West Bengal. Non-woven agro-textile materials of different thickness (250, 300, 350, 400 and 500 gsm) were procured and physical parameters like aparent opening size, fabric density, sectional air permeability, breaking load of agro-textile mulches were studied. Fabric density varied from 0.108 to o.135g/cc and AOS from 247 to 235 micron in 300gsm and 500gsm agro-textiles respectively. Agro-textile mulches have been laid in the experimental plots of winter vegetables of Ramakrishna Mission Vivekananda University, Narendrapur; South 24-paraganas; Bidhan Chandra Krishi Viswavidyalaya adpated farmers' field, Nadia; and research farm of Viswa Bharati University at Sriniketan. High value Broccoli crop was grown in all the three locations. Initial soil samples have been collected for analysis in all the locations. Observation of soil and plant parameters has been taken for one month. Readings on Broccoli plant height and number of leaves at regular intervals during crop growing seasons and yield of crops were taken in the mulch laid plots. Weed cover data from the experimental fields were also studied. Broccoli was harvested from all the plots during first week of March. After harvest of crops, soil samples were collected from all the plots for physical, chemical and microbiological analysis. Chemical analysis of soil samples of three locations have been done after harvest of Broccoli. Organic matter (%) varied from 0.45% in control to 0.72% in 500gsm plots, whereas available Phosphorus varied from 12.9 kg/ha in control to 29.2 kg/ha in 500gsm plots. Available potassium varied from 161kg/ha in control to 317kg/ha in 300gsm plots. Around 43% fall and 35% fall in strength of 300 gsm fabric was observed after 4 months exposure and usage as mulching at new alluvial soil and red laterite soil respectively. Around 40% in cross direction and 68% in machine direction in case of 500 gsm fabric for the same duration of usage in the new alluvial soil conditions. Agro-textile 300gsm was found to be most economical in all the locations. Maximum reduction in cost of cultivation was observed in red and laterite soil zone.

Figure QEI 15.1. Non woven agro-textile experiment on broccoli in farmers' field at Gayeshpur, Nadia

QEI 16 Development of electronic colour and lustre meter for jute and mesta fibre

Dr G Roy

Colour & Luster are two important parameters for the grading of jute & Allied fibres. Colour of the fibre distinguishes the appearance of the fibre and is largely dependant on retting conditions. Luster is the amount of reflected light for an incident light from a medium. In jute and allied fibres, it is measured in the term of the grey scale index value. The colour & luster meter for measurement of colour & luster of jute and allied fibres has been designed and developed by NIRJAFT almost two decades ago using the principle of reflectance photometer, which can measure the brightness and luster of the fibre sample in terms of diffused and specular reflectance using photo electric cell.

Two types of Colour measurement instrument for jute has been developed as given below.

1. A ***very low cost handy type*** instrument has been developed where only indications will be available for three major colour ranges of the fibre sample. Only 3 LEDs have been used for the indication of the range of colour. Its main features are:

- It is completely automatic type and will work on Light Reflectance technique.
- No expertise will be required to operate the new proposed instrument.
- It is a very low cost device.
- It is completely portable & can work with rechargeable cells/solar cells/primary cell.

2. A ***laboratory type*** of colour and lustre meter for quantitative measurement of the parameters has been developed. For Laboratory type, digital 7-segment display indicates the colour and luster properties of the fibre. Its main features are:

- It is completely automatic type and will work on Light Reflectance & Specular reflectance method.
- The value of colour in terms of whiteness value and the luster value is displayed digitally.
- No expertise is required to operate the new proposed instrument.
- It can work both on AC 230V, 50Hz supply and from battery supply.
- Computer interface is present and can be used for stored data transfer in the computer.

At present the colour measurement part is completed. The luster measurement part is under progress and will be completed within September, 2015.

Photograph of the instruments :

Figure QEI 16.1. Low cost handy colour indicator

Figure QEI 16.2. Laborary type Electronic Colour and Lustre

Mechanical Processing Division

Priority areas of research

- Utilisation, value addition and process development of lesser known fibres i.e. sisal, linseed, banana, sun hemp, coconut fibre, etc.
- Development of nonwoven machine
- Development of modern yarn and fabric testing instruments
- Modification of fibre prior to spinning
- Development of diversified products
- Improved /online process control
- Technology development for decentralized sector
- Eco-friendly processing system

Achievements

- Fabric electrical insulation tester has been designed and developed.
- The conceptual design of the portable coconut fibre strength tester has been fabricated.
- A motorized fabric inspection table has been designed and fabricated.
- Eco-friendly water miscible jute conditioning agent has been developed and under trial.
- Spinning of PALF in cotton and silk spinning system produces better quality of yarn.

MP 8 Development of PALF/Ramie/ Silk blended apparels

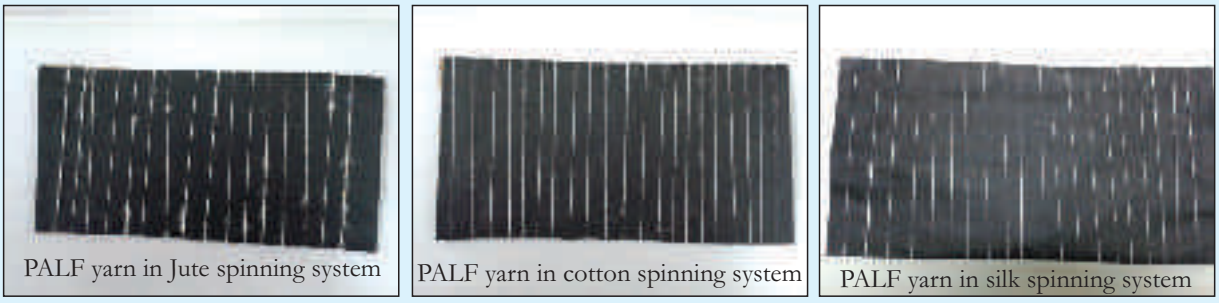
Sh. Seiko Jose, Dr. G. Basu & Izhar Mustafa

This is a project undertaken in order to use the under exploited fibres like pineapple leaf fibre and ramie available from North East part of India. Emphasis has been given to blend PALF and ramie with Eri silk, which is also available in North East to make yarn and ultimately fabric. It will be value addition to under exploited fibres of under developed areas.

The decorticated PALF were subjected to water retting. The physical parameters of decorticated and retted PALF were analyzed and listed in the Table MP 8.1. In the present scenario, there is no standard system for the spinning of PALF due to its low production and less availability in the market. The spinning was carried out in three different spinning systems, viz, cotton, jute and silk. The quality evaluation of yarn has been performed. Spinning trials and optimization of spinning parameters for jute, ramie, PALF and Eri silk has been done. It was found that in case of PALF out of the above three spinning systems, processing in cotton and silk system gave better results.

Table MP 8.1: Physical properties of decorticated and retted PALF fibre.

Sl. No	Parameter	Decorticated PALF fibre	Water retted PALF fibre
1	Tenacity (cN/tex)	21.13	22.53
2	Tensile strain at break (%)	4.30	3.97
3	Initial modulus (cN/tex)	1038.8	1009.7
4	Specific work (mJ/tex-m)	4.94	5.0
5	Bundle strength (g/tex)	22.58	19.23
6	Avg. Diametre (microns)	53.31	50.49
7	Fineness (tex)	1.40	1.30
8	Flexural rigidity (mN-mm²)	3.81	3.27
9	Coefficient of friction(Perpendicular)	0.42	0.44
10	Coefficient of friction (Parallel)	0.64	0.64
11	Whiteness Index	44.33	59.53
12	Brightness Index	15.38	41.18
13	Absorbency (sec)	40	2
14	Moisture regain (%)	5.80	8.00



PALF yarn in Jute spinning system | PALF yarn in cotton spinning system | PALF yarn in silk spinning system

Figure- MP 8.1: Black board appearance of PALF yarn in different spinning systems

MP 9 Development of expert system for analysis of defects of jute fabrics during inspection

Sh. Sujai Das & Dr. Surajit Sengupta

Manual evaluation of fabric faults by quality control skilled personnel is the common practice by textile mills. The automation in fault finding will give fast and accurate results with unskilled manpower. With this aim an attempt has been made to develop a computerized system for fault detection in jute febric using image processing technique.

The fabric inspection table has been developed for offline inspection of fabric using camera for defect analysis. The fabric passes through semi-transparent platform which can be adjusted by lower and upper light for uniform and clear visibility of fabric. It contains cloth roller, take off roller and other rollers for smooth and tight movement of fabric on platform. This roller movement is operated by motor which can be controlled by backward- forward switch, start-stop switch and speed control knob. It has sensor for display fabric length and fabric speed on platform. It has reset button to start counting the length of fabric. The panel box also contains upper light, lower light and both light switch buttons. It has horizontal camera stand which can move up and down vertically by adjustment wheel. Camera has been mounted on the camera stand above inspection table. Camera has been integrated to the inspection software using USB cable and capturing data online of moving fabric image. All camera adjustments like focus, brightness, contrast, etc. has been controlled from inspection software. Preparation of jute defective fabric and its capture of images on inspection platform using inspection software have been completed. Inspection software measures and analyses the fabric defects and expressed as no. of defects, defect map, point & intensity of defect graph at different position of fabric, % of defect, length captured, etc.

Figure- MP 9.1 : Inspection table with fabric

Figure- MP 9.2 : Control panel of inspection table

The inspection table has been fabricated with following devices:

1) Continuous and inching motion
2) Forward and backward motion
3) Speed changing devices
4) Maximum possible width 46 inches
5) Top cover to eliminate overhead light interference
6) Camera holding bracket with adjustable height
7) Speed counter
8) Fabric length counter

Several trials have been conducted for visual inspection of cloth using this table.

MP-10: Development of nonwoven fabrics from banana and sunhemp

Dr. Surajit Sengupta, Dr. Sanjoy Debnath & Shri Kamal Banerjee

Worldwide rapid growth of nonwoven industry for synthetic technical textiles is due to its excellent hydraulic, insulation, impact resistance and filter properties. India has a great strength to grab a major share with different natural fibres nonwoven textiles if industries are able to adapt suitable technology in this field. Standardization of nonwoven products from banana and sunhemp and their design are not available. Hence, an attempt has been made to explore the possibility of development and identification of uses of nonoven fabrics from long vegetable and under exploited fibres like banana and sunnhemp.

a) Fibre Properties

Fibre Properties of the available fibres have been measured using standard process from breaker card sliver

b) Process:

Sunhemp reeds were cut in 1 m length and sprayed with 1.5% Castor oil emulsified in 25% water. The wet fibres were kept in a closed container (bin) for 24 hrs. Then removing from the bin, it was processed in the jute breaker card and finisher card to shorten and open the fibres. This fibres were fed to the conveyor of carding machine of nonwoven preparation and finally a pre-needled fabric was made. This pre-needled fabric was stacked and needled in layers to get required gsm fabric.

Banana fibre was sprayed with 1.5% Castor oil emulsified in 35% water. The wet fibres were kept in a closed container (bin) for 24 hrs. Then removing from the bin, it was processed in the jute breaker card to shorten and open the fibres. This fibres were fed to the conveyor of carding machine of nonwoven preparation and finally a pre-needled fabric was made. This pre-needled fabric was stacked and needled in layers to get required gsm fabric.

Table - MP 10.1 : Process parameters

	Sunhemp	Banana
Jute breaker card dropping (%)	16	12
Nonwoven card dropping (%)	18	12
Feed conveyor speed (m/min)	0.23	0.26
Feed in card (g/m^2)	500	600
Card doffer surface speed (m/min)	15 .1	19.90
Cross lapper surface speed (m/min)	15.4	20.2
Needling machine feed speed (m/min)	0.75	0.9
Delivery speed (m/min)	0.77	1.01
Punch density (p/sq cm)	160	190
Depth of needle penetration (mm)	12	12
Pre -needled fabric weight (g/m^2)	55	65
Moisture content in feed material (%)	16	20
Fabric gsm cv (%)	21	12

c) Modification suggested

During the process optimization it was found that some mechanical modification is required for smooth and uninterrupted processing of natural fibres.

Modification required for better uniformity, low card dropping and higher processing speed

1. Conveyor belt between doffer and cross-lapper 2. Perforated/non-perforated plate below card

d) Fibre softening

Sunhemp fibres were treated for 15 mins in

(1) boiled water (2) 1% nonionic detergent under boil

(3) 1% NaOH Soln (4) 1% HCl solution

Testing is going on. By hand feeling, it was found that 1% nonionic detergent under boil shows the improved fibre.

e) Fabrics prepared

Needle punched nonwoven fabrics in following combination & have been prepared

(a) Sunhemp (100%); 300, 600, 900 gsm

(b) Banana (100%); 300, 600, 900 gsm

(c) Sunhemp:Jute (50:50); 300, 600, 900 gsm

(d) Banana : Jute (50:50); 300, 600, 900 gsm

(e) Sunhemp: PP (50:50); 300, 600, 900 gsm

(f) Banana: PP (50:50); 300, 600, 900 gsm

(g) Sunhemp: Banana (50:50); 600 gsm

f) Testing

At present following testing has been done. Some of the results have been shown below.

(a) Tenacity (b) Elongation (c) Stress relaxation (d) Creep

Table - MP 10.2: Some of the test results

Sl. No.	Sample Name	G/m²	Max.load N	Extension %	Tenacity cN/Tex	Creep %	Relaxation %
1.	Banana:PP (50:50) m/c	578	89.25	117.30	0.62	7.92	26
2.	Banana:PP (50:50) cross	578	215.41	82.69	1.74	7.67	15
3.	Banana:Jute (50:50) m/c	590	11.85	26.39	0.08	0.54	41
4.	Banana:Jute (50:50) - cross	590	30.83	31.63	0.21	0.31	42
5.	Banana (100%) - m/c	625	36.04	43.36	0.23	7.82	28
6.	Banana (100%) - cross	625	33.22	45.37	0.21	6.62	45
7.	Sunhemp:Jute (50:50) - m/c	608	17.26	37.09	0.11	2.01	44
8.	Sunhemp:Jute (50:50) - cross	608	38.86	41.24	0.26	0.62	44

Figure MP 10.1: Nonwoven fabrics from banana and banana-polypropylene blend

MP-11 : Development of portable coconut fibre strength tester

Dr. G. Basu, Sh. C. Kundu, Sh. P. Chowdhury & Sh. L. M. Patra

This project was undertaken in order to develop a portable coconut fibre tester. In the present scenario, there is no such instrument available for coconut fibre grading. The machine is being designed on the principle of Constant rate of extension (CRE).

The following progress has been made during the reporting period:

1. Drawing and designing: Drawing and designing of portable coconut fibre strength tester (details spares drawing, flow diagram, isometric view, 2D modeling & video projection) has been performed through CAD software.
2. Mechanical fabrication: Fabrication of i) base frame and ii) Motion transmission system including lead screw, fibre gripping arrangement, drive system, limit switch, etc. have been completed.
3. System design: Layout of the system design of electronic interface is completed.
4. Fabrication of electronic parts: Layout and fabrication of P.C.B has been done.
5. Necessary software & firmware (Hardware based software) has been developed.
6. Programming of data accusation for load cell has been developed.
7. Programming of stepper motor drive (torque, 4 kg-cm^2, 12 V, 2 pole DC motor, step ratio, 0.9° rotation per pulse) has been developed.
8. Integration and fabrication of display unit of the instrument is nearly completed.

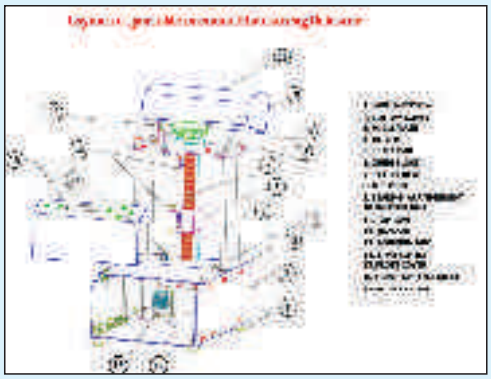


Figure - MP 11.1 : Layout of tester

Figure - MP 11.2 : Photograph of tester

MP 12 Development of coated /laminated products based on jute

Dr. G. Basu, Sh. Seiko Jose

This is a project aiming to coat/ laminate jute based fabrics. Coating a layer of polymer material on a textile imparts new characteristic to the base fabric. The types of fibre commonly used in coating are cotton, rayon, nylon, polyester, and their blends depending on the end user requirements. The choice of proper fabric for coating is as important as the selection of the polymer, because it offers the primary physical property to the end product. For proper selection of fabric, the following aspects need to be considered: strength and modulus, creep behaviour, resistance to acids and chemicals, adhesion requirement, resistance to microbiological attack, environment of use, durability, dimensional stability and cost.

During the reporting period, 5 lbs, 8 lbs and 10 lbs yarns were spun. The yarn were tested in Instron tensile tester and the strength parameters were found to be satisfactory. Fabric is woven by these yarns with different constructions. The four different fabrics developed were 100 % jute fabric with herringbone twill weave, 100% jute fabric with 4x4 matt weave, 100 % jute with plane weave and jute/cotton fabric with plane weave. The fabrics were tested for their physical parameters and listed in the Table MP 12.1.

Figure - MP 12.1: Different base fabric samples for coating

Table MP 12.1 : Physical properties of the woven fabric

	Herring-bone Twill weave (2x1) 100% jute (517g/m²)		Matt weave (4x4) 100 % jute (543g/m²)		Plain weave 100 % jute (216g/m²)		Plain weave jute / cotton (286g/m²)	
Properties	Warp Direction	Weft Direction	Warp Direction	Weft Direction	Warp Direction	Weft Direction	Warp Direction	Weft Direction
Breaking Load (N)	1631.32	749.82	1388.04	664.10	537.75	674.23	234.64	1246.53
Strain at break (%)	7.54	5.85	3.57	5.34	5.51	3.95	15.73	1.87
Tenacity (cN/tex)	6.31	2.90	5.11	2.45	4.98	6.20	1.64	8.47
Work of Rupture (mJ)	6462.05	2568.49	2815.41	2120.40	1444.03	1535.03	3585.43	2303.43

MP 13 Development and evaluation of eco-friendly water miscible jute conditioning agent

Sh. Seiko Jose & Izhar Mustafa

The main objective of the work is to provide an eco-friendly, bio- degradable, non toxic jute conditioning agent for instant preparation of emulsion using chemically modified oil, which eliminates the step of mixing the emulsifiers with the oil by the user making it user friendly. The present work seeks to overcome the above mentioned drawbacks of conventional process of making emulsion with JBO. It provides a composition of

eco-friendly jute conditioning agent for application, which is miscible with water. Only water is to be added to prepare the oil-in-water emulsion, which is to be sprayed on raw jute to provide adequate softening / lubricating properties to the jute fibers for smooth processing.

During this one year, standardization of sulfation process in lab scale has been completed. The physical parameters of chemically modified castor oil were analysed and compared with conventional jute batching oil (JBO). A machine was designed and developed for large scale sulfation in the pilot plant. It is expected that newly developing water miscible composition of eco friendly jute conditioning agent will particularly help export oriented units in producing good quality jute fibre for meeting the international and European standards / norms. The physical properties of jute batching oil (JBO) and modified castor oil is given in Table MP 13.1.

Table - MP 13.1 : Physical properties of JBO and Sulphated Castor oil

Sl. No.	Parameter	JBO	Sulphated Castor oil
1	Colour of emulsion	Pale yellow	Off white
2	Odour of emulsion	kerosene	No characteristic odour
3	Stability of emulsion (days)	2-3	4-5
4	Flash point of oil	130oC	> 300oC as dry residue
5	Viscosity of oil (cp)	16.5	32.63
6	Specific gravity of oil	0.86	0.97
7	pH of oil	7.8-8.2	7.0- 7.5
8	pH of emulsion (2.5 %)	7.8-8.0	7.2-7.5
9	Moisture content of oil (%)	0.4-0.5	10.5-11.2
10	Water solubility	Water insoluble	Water miscible
11	Solubility in alcohol	Not soluble	Soluble
12	Shelf life	>1 year	> 6 months
13	Toxicity	Reported as carcinogenic	Non toxic (IS 6582, Part2)

Figure- MP 13.1 : Sulfated castor oil

Figure - MP 13.2: Sulfated castor oil emulsion (2%)

Priority areas of research

- Bio composites based on jute and other agro residues
- Eco-friendly pulping process suitable for small scale industry
- Low water textile finishing of jute fabric
- Application of biotechnology and nanotechnology in jute processing

Achievements

- Sequential bio-treatment on jute or sunnhemp can produce good quality handmade paper following low chemical Alkaline Sulphite Anthraquinone Methanol (ASAM) pulping.
- Development of particle board from coconut stem particles using 12% hydrolysed lac as bio-adhesive.
- Development of printing of single or double mordanted jute fabric using manjistha and annatto dyes in powder form. Printing of natural dyes on bleached jute fabric by pigment printing process produces bright colour and sharp outline.
- Nano SiO_2 improves the water repellent property of fabric by 10% and can withstand up to 10 domestic washing.
- Nano Ag applied jute fabric is fast upto 25 home launderings and resistant against anaerobic microorganism for 15 days.

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

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

The main objective of this project is the utilisation of biocatalysts to produce pulps with lower chemical and energy consumption using different lignocellulosic fibres and production of paper with improved optical and physical properties.

(A) Bio-treatment and pulping of jute fibre

Bio-treatment: Jute fibres were cut into small length (1-2") and subjected to three different treatments

(I) Cellulase-xylanase
(ii) Lacasse
(iii) Sequential treatment of Cellusase-xylanase followed by lacasse

Cellulose-xylanase treatment:

Jute fibres were dipped in a solution containing cellulase-xylanase enzyme (2%, owf) using a material to liquor ratio at 1:10, temperature 50 °C, pH 4 - 5.5 and treatment continued for 4 hours with constant stirring. After the treatment the content was boiled for one hour with 0.1% non-ionic detergent followed by washing.

Lacasse treatment:

Jute fibres were dipped in a solution containing laccase (1%, owf), Hydroxybenzotriazole, HBT (1%, owf) using a material to liquor ratio 1:10, temperature 50 °C, pH 4 - 5.5 and treatment continued for 4 hours with constant stirring. After the treatment, the content was boiled for one hour with 0.1% non-ionic detergent followed by washing.

Sequential treatment of cellulose- xylanase followed by lacasse:

Jute fibres were first treated with cellulose- xylanase as in (i) followed by lacasse treatment as in (ii).

Pulping: All the enzyme treated fibres were subjected to low chemical Alkaline Sulphite Anthraquinone Methanol (ASAM) pulping using sodium hydroxide (1.2%), sodium sulphite (5%), Anthraquinone (0.1%) and methanol (5%) at a liquor ratio of 1:12 for 3 hours. Three different temperatures like 95 °C, 115 °C, and 160 °C were used for pulping.

(B) Bio-treatment and pulping of sunnhemp fibre

Bio-treatment: Sunnhemp fibres were cut into small length (1-2") and subjected to sequential treatment of Cellusase-xylanase followed by lacasse either before or after pulping. Sunnhemp fibres were dipped in a solution containing cellulase-xylanase enzyme (4%, owf) using a material to liquor ratio at 1:10, temperature 50 °C, pH 4 - 5.5 and treatment continued for 3 hours with constant stirring. After the treatment the content was boiled for one hour with 0.1% non-ionic detergent followed by washing. These treated fibres were again dipped in a solution containing laccase (1%, owf), Hydroxybenzotriazole, HBT (0.5%, owf) using a material to liquor ratio at 1:10, temperature 50 °C, pH 4 - 5.5 and treatment continued for 4 hours with constant stirring. After the treatment the content was boiled for one hour with 0.1% non-ionic detergent followed by washing.

Pulping: Control and enzyme treated fibres were subjected to Alkaline Sulphite Anthraquinone Methanol (ASAM) pulping as follows

High chemical ASAM pulping - Control sunnhemp fibres were treated in a solution containing sodium hydroxide (5 %), sodium sulphite (20 %), Anthraquinone (0.1%) and methanol (15 %) using a liquor ratio of 1:12 for 3 hours at 160°C . The pulps were washed thoroughly after pulping.

Low chemical ASAM pulping - Control and enzyme treated sunnhemp fibres were treated in a solution containing sodium hydroxide (1.2%), sodium sulphite (5%), Anthraquinone (0.1%) and methanol (5%) using a liquor ratio of 1:12 for 3 hours at 160°C. The pulps were washed thoroughly after pulping.

(C) Beating: All the pulps were subjected to beating in laboratory scale valley type beater for different durations to produce pulp of 40° SR freeness.

(D) Paper sheet formation: Paper sheets of 60 GSM were produced by using semi-automatic paper sheet Making Machine.

(E) Evaluation

All the paper sheets produced from all these fibres 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 paper sheets produced from all these fibres was determined by Spectrascan-5100 computerised colour matching system using relevant software.

Physical properties : Paper sheets produced from all these fibres were evaluated for Tensile properties by Tappi Test Method - T404 om-85, Bursting Index by Tappi Test Method - T403 om-85, Tearing strength by Tappi Test Method - T414 om-88 and Folding endurance (Schopper type) by Tappi Test Method - T423 om-89.

Table - CBP 7.1: Paper samples produced from jute fibre

Sl. No.	Sample	Code
i)	Cellulase-xylanse treatment and ASAM pulping at 95 °C	X1
ii)	Cellulase-xylanse treatment and ASAM pulping at 115 °C	X2
iii)	Cellulase-xylanse treatment and ASAM pulping at 160 °C	X3
iv)	Lacasse treatment and ASAM pulping at 95 °C	Y1
v)	Lacasse treatment and ASAM pulping at 115 °C	Y2
vi)	Lacasse treatment and ASAM pulping at 160 °C	Y3
vii)	Sequential cellulase-xylanase and laccase treatment and ASAM pulping at 95 °C	Z1
viii)	Sequential cellulase-xylanase and laccase treatment and ASAM pulping at 115 °C	Z2
ix)	Sequential cellulase-xylanase and laccase treatment and ASAM pulping at 160 °C	Z3

Optical and physical properties of the paper samples were evaluated using standard procedures and have been tabulated in Table-CBP7.2 & Table-CBP7.3

Table-CBP 7.2 : Optical properties of paper samples

Samples	Max	K/S	Whiteness Index (HUNTER)	Yellowness Index (ASTM D-19250	Brightness Index (TAPPI 452)
X1	420	0.83	63.52	34.15	35.09
X2	420	0.88	63.83	36.47	34.95
X3	420	2.90	43.57	45.69	15.53
Y1	420	0.83	64.10	34.55	35.72
Y2	420	0.77	64.42	32.85	36.31
Y3	420	2.93	43.85	44.69	15.79
Z1	420	0.79	65.15	35.23	36.75
Z2	420	0.75	65.62	33.82	37.52
Z3	420	1.83	50.81	40.50	21.68

Table- CBP 7.3 : Physical properties of paper samples

Samples	GSM	Folding Endurance (No.)	Tear Index (mNm^2/g)	Tensile Index (Nm/g)	Burst Index ($Kpam^2/g$)
X1	62	1	4.83	16.91	0.98
X2	58	3	5.81	28.48	1.31
X3	54	18	6.66	47.23	2.83
Y1	60	2	5.33	25.07	1.18
Y2	60	7	6.78	35.46	1.91
Y3	60	60	7.01	55.30	3.47
Z1	60	4	6.78	28.34	1.26
Z2	59	10	7.41	39.24	2.14
Z3	54	190	10.37	62.97	4.32

Findings :

- Analysis of optical properties of papers clearly indicate that whiteness and brightness is low in case of pulping at 160 °C but it is improved in case of sequential bio-pretreatment i.e. cellulase-xylanase followed by lacasse.
- Physical properties of the paper samples varies widely with method of bio-pretreatement as well as temperature of pulping. Physical properties are

best in case of pulping at 160°C for all the enzyme treated samples.

- Among the method of bio-pretreatement, sequential treatment of cellulase-xylanase followed by lacasse produce best quality paper while it is medium in case of lacasse pre-treatment.
- So, low chemical ASAM pulping can produce paper with good physical properties and optical properties can be improved by suitable bleaching process.

Table- CBP 7.4 : Paper samples produced from sunnhemp fibre

Sl. No.	Sample	Code
i)	High chemical ASAM pulping	A
ii)	Low chemical ASAM pulping (Paper produced after mixing with 30% jute pulp)	B
iii)	Enzyme treatment followed by low chemical ASAM pulping	C
iv)	Low chemical ASAM pulping followed by enzyme treatment	D

Optical and physical properties of the paper samples were evaluated using standard procedures and have been tabulated in Table-CBP7.5 & Table-CBP7.6

Table-CBP 7.5 : Optical properties of paper samples

Samples	Max	K/S	Whiteness Index (HUNTER)	Yellowness Index (ASTM D-19250	Brightness Index (TAPPI 452)
A	420	0.40	71.57	22.36	46.86
B	420	1.66	53.27	40.03	23.72
C	420	0.83	63.82	33.90	35.09
D	420	1.05	60.09	34.39	31.18

Table- CBP 7.6 : Physical properties of paper samples

Samples	Folding Endurance (No.)	Tear Index (mNm^2/g)	Tensile Index (Nm/g)	Burst Index ($Kpam^2/g$)
A	1965	29.03	54.85	5.42
B	3317	20.22	47.76	4.53
C	1306	24.00	51.38	3.70
D	5000	25.82	45.19	4.32

Findings:

- Tearing and folding properties are very high in case of paper produced from sunnhemp fibres.
- High chemical ASAM pulping produce the best quality paper with respect to optical and physical properties.
- In case of low chemical ASAM pulping , 30% jute pulp is required to be mixed with sunnhemp pulp for making paper with high folding properties but optical and physical properties are slightly lower.
- Biotreatment followed by low chemical ASAM pulping can produce paper comparable to that produced by high chemical ASAM pulping.

CBP 8 Development of bio-adhesives for the use of agricultural eresidues (cassava Stalk, Coconut stem) in preparation of particle board

Dr. N. C. Pan & Sh. K. Patra

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. During this period, the particle board was developed from coconut stem particles using two different bio-adhesives viz., chitosan and hydrolysed lac and compared this with the board prepared from synthetic resin. Bio-adhesives are biodegradable and environment friendly in nature. In this study, biodegradable adhesives viz. chitosan and hydrolysed lac was used.

Chitosan - It is a polysaccharide (amino sugars) obtained by deacetylating chitin, a natural bio-polymer originating from the shells of exo-skeletons of crustaceans like shrimp, lobster, crabs and other shellfish. It is a cationic polymer.

Hydrolysed lac - The mother liquor is acidified with hydrochloric acid (10%) and the precipitated soft mass is repeatedly washed with water to remove the last traces of mineral acid and dried at 1000C to yield the desired gummy hydrolysed lac.

Developments of coconut stem particle board

Coconut stems were cut into small pieces and chipped in grinding machine. Chipped particles after uniform mixing separately with i) synthetic resin urea formaldehyde (UF) in 12% concentration ii) bioadhesive chitosan in different concentration (1%,3%,5%) iii) bioadhesive hydrolysed lac in different concentration (9%, 12%) in an U-trough mixer fitted with sigma type blade were transferred in a square mould which has supported with smooth aluminium plates on both sides and transferred in hydraulic press. The optimum temperature 1400C, pressure 15 Kg/cm^2 and duration 25 minutes were maintained. Thereafter, the pressure was released and the board was taken out in hot condition and allowed to cool. After it has been cooled, the board edge - finished by electric sawing machine and stored for conditioning.

Coconut Stem Particle Board using Chitosan as bioadhesive

Coconut stem Particle Board using Hydrolysed Lac as bioadhesive

Evaluation

The developed boards were evaluated for different physical properties viz, flexural strength, flexural modulus, ILSS (inter lamellar shear strength), moisture uptake (24h), etc following standard procedure. The test results are tabulated in Table CBP 8.1 and Table CBP 8.2 respectively.

Table - CBP 8.1: Mechanical properties of coconut stem particle boards using chitosan as bio-adhesive

Sl No	Coconut stem particle board using	Flexural strength MPa	Flexural modulus GPa	ILSS N/mm²	Moisture uptake (24h) %
1	1% Chitosan	0.52	0.15	0.02	3.77
2	3% Chitosan	6.33	1.32	0.20	4.68
3	5% Chitosan	6.65	1.23	0.21	5.27
4	12% Urea Formaldehyde Resin	5.68	1.23	0.18	4.55

Table - CBP 8.2: Mechanical properties of coconut stem particle boards using hydrolysed lac as bio-adhesive

Sl No	Coconut stem particle board using	Flexural strength MPa	Flexural modulus GPa	ILSS N/mm²	Moisture uptake (24h) %
1	9% Hydrolysed Lac	5.65	1.94	0.17	5.10
2	12% Hydrolysed Lac	6.90	2.21	0.21	4.52
3	12% Urea Formaldehyde Resin	5.68	1.23	0.18	4.55

Findings

- Production of particle board from coconut stem particles using 3% chitosan as bioadhesive is possible with good flexural strength and flexural modulus value.
- Making of particle board from coconut stem particles using 12% hydrolysed lac as bioadhesive showed encouraging result and comparable with the boards prepared from synthetic resin in respect of strength.
- The process and the product made by using bioadhesives are comparable with that produced by conventional urea formaldehyde resin.
- This will give an opportunity for alternative use of raw materials.

CBP 9 Functional finishing of jute textile by suitable Nano-particles

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

The main objective of this project is to to identify, synthesize and characterize suitable nano-particle for antimicrobial, flame retardant and water repellent finish on jute textiles.

Antimicrobial Finishing of Jute Textile by Silver Nano Particle

Soil burial test for nano silver applied jute fabric

The biodegradation of nano silver treated jute fabrics was carried as per ISO 11721-1:2001 standard. The pH of the test soil was maintained as 7.5; samples were kept for 14 days and incubated with 100% relative humidity

and 29°C. After the defined burial time, the samples were removed from the soil and rinsed in ethanol/water (70%/30% volume fraction) solution for 10 minutes before drying at room temperature and evaluated for their tensile property of the fabric as per standard (Table CBP 9.1).

Table - CBP 9. 1: Tensile property of jute fabrics before and after soil burial test

Property / Sample	Tenacity (cN/Tex)		Initial modulus (N/m^2)		Strain at break (%)	
	Before	After	Before	After	Before	After
Untreated Jute fabric	6.12 (12%)	1.80 (8%)	33.3 (22%)	18.4 (11%)	1.1 (18%)	0.9 (9%)
NaOH treated jute fabric	7.43 (11%)	3.41 (12%)	48.7 (20%)	24.5 (35%)	1.2 (18%)	1.3 (22%)
Nano Ag applied jute fabric	6.40 (6%)	4.20 (6%)	35.2 (17%)	31.5 (10%)	1.8 (32%)	2.0 (11%)

(%CV in parenthesis)

It is inferred that tenacity of the jute fabric is improved after nano silver treatment (7%), while after soil burial; tenacity is reduced in all treated jute fabrics. The rate of tenacity reduction is 71%, 54% & 34% is observed in untreated, NaOH treated & nano Ag treated jute fabric respectively. It is inferred that nano silver applied jute fabric resist the fungal attack (under soil condition) similar to NaOH treated jute fabric. Similar to tenacity, retention of initial modulus of jute fabric is higher in nano Ag applied jute fabric than other fabrics and there is no change in strain of the fabric after soil burial.

Accelerated washing test for nano silver applied jute fabric

Accelerated washing test for nano Ag treated jute fabric was carried as per AATCC 61-2006 (Test method 3A) method, in which one accelerated washing is equivalent to five home commercial laundering. Nano silver treated jute fabric is sandwiched with bleached jute fabric and treated with soap-soda solution (2gpl sodium carbonate, 5 gpl non-ionic detergent, 65°C, MLR 1:50, 30 minutes) followed by washing with distilled water and drying at ambient condition. After accelerated washing, K/S, ΔE, whiteness index, brightness index, change in shade and change in staining of accelerated washed nano silver treated and bleached jute fabrics as per AATCC grey scale in Premier Colourscan instrument (Model SS6200) in 10° observer/ D65 illumination, were measured and the values are given in the Table CBP 9.2.

Table- CBP 9.2: Effect of accelerated washing on nano silver applied jute fabric

Number of washes	K/S value	Colour Difference (ΔE)	% colour strength	Change in shade (AATCC)
0	4.228	--	100.0	--
5	4.189	1.03	93.9	5
10	3.999	2.07	89.6	4-5
15	4.046	2.50	90.6	4-5
20	3.720	2.96	83.3	4-5
25	3.748	1.34	84.0	4-5

It is inferred that the K/S value of nano silver treated jute fabric is not reduced significantly. It is indicated that silver nano particles have good bonding with jute fibre and so shown good stability against the home laundering up to 25 washes. After 25 washes, nano silver may be removed from the jute fabric slightly at the extent of 16% with AATCC grade of 4-5 in comparison with unwashed fabric.

Table - CBP 9.3: Whiteness index and antibacterial activity of nano silver applied jute fabric accelerated washings

Number of washes	Whiteness index (ASTM E313)	Change in staining (AATCC)	Zone of inhibition (mm)	Bacterial growth on fabric
0	41.4	--	2.5±0.3	No
5	40.3	5	2.2±0.4	No
10	39.6	5	2.1±0.3	No
15	39.4	5	2.0±0.2	No
20	38.8	4-5	1.5±0.3	No
25	35.4	4-5	1.0±0.4	No

To study the staining ability of nano silver on adjacent fabric, the whiteness index of bleached fabrics were measured and tabulated in Table CBP 9.3. It is observed that, nano silver did not adhere on the bleached fabric at home laundering condition. 25 washed adjacent bleached fabric shown reduction in whiteness index of only 6 scales (35.4) with AATCC grade of 4-5 in comparison with unwashed fabric (41.4). The effect of accelerated washing is also assessed by evaluating the antibacterial activity of nano Ag applied jute fabric as per AATTC 100 method against gram positive bacteria. It is observed that, nano silver retains its antibacterial activity up to 25 washes. The zone of inhibition is decreased with increase in the wash cycles, and it might be due to partial removal of nano silver on the surface of the jute fibre.

Water Repellent Finishing of jute textile by Silica Nanoparticle

Identification of water repellent nano particle

Among different nanoparticles, metal oxide nanoparticle like ZnO, SiO2, Al2O3 and TiO2 are able to impart water repellent finish on cellulosic textiles. Among them, ZnO and SiO2 can be easily synthesized by wet chemical method i.e. alkaline hydrolysis of respective metallic salts at ambient condition, while other metallic oxide need additional thermal energy. By considering the ease of synthesis, SiO2 is selected for suitable water repellent nano particle for jute textiles.

Novel synthesis method of nano silica sol

Generally silica nano particle is synthesized by alkaline hydrolysis (by ammonia) of alkyl silane followed by stabilization by a polymer in presence of ethyl alcohol at pH 9.5-10.5. In order to reduce the addition of ammonia as well as stabilizing agent, a novel synthesis method was formulated (Figure CBP 9.1)

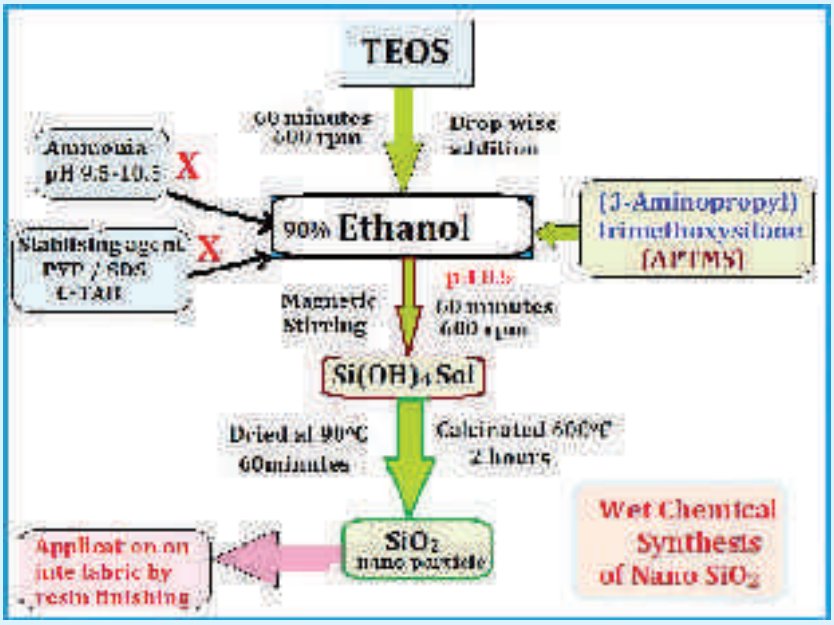


Figure - CBP 9.1 Flowchart of novel chemical synthesis of silica

In this method, tetra ethyl ortho silicate (16.0ml) was taken as precursor and was dissolved in 82 ml of ethanol (90% solution) and stirred for 60 minutes using magnetic stirring. After formation of homogenous mixture, 2 ml of 3-amino propyl trimethoxy silicate (APTMS) was added slowly to TEOS for 10 minutes and the solution was stirred @ 600rpm for 60 minutes at pH 8.5. APTMS was used as stabilizing agent as well as alkali for the conversion of TEOS into $Si(OH)^4$. After 30 minutes, nano $Si(OH)_4$ sol was formed as turbid gel. The nano silica sol was then dried at 90°C for 1 hour in order to remove alcohol, followed by calcinated at four different temperatures i.e. 300, 400, 500 & 600°C for 2 hours. The yaield of nano silica is ranged from 4.10 to 4.28% with 15% yield efficiency.

Characterization of nano $Si(OH)_4$ sol and nano silica

The nano $Si(OH)_4$ sol and nano silica is characterized by UV-Visible Spectroscopy (UV-VIS) and transmission electron microscopy (TEM). UV-VIS spectroscopy of synthesized nano silica sol gave $_{max}$ at 220 nm which confirmed the presence of nano silica.

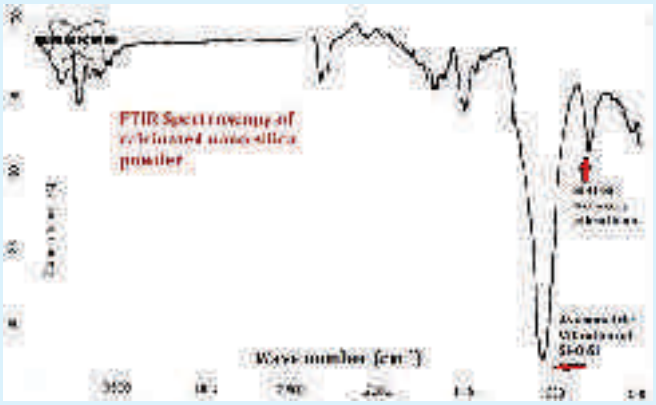


Figure - CBP 9.2 : FTIR speetra of nano silica

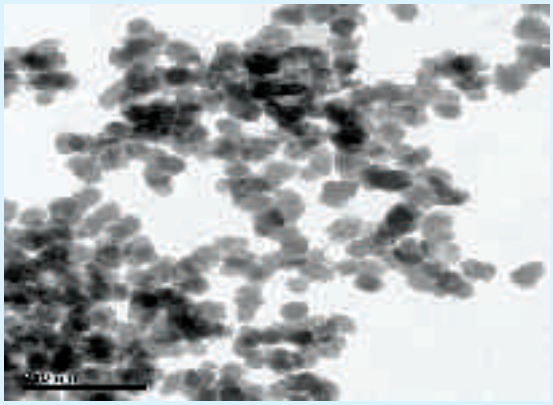


Figure - CBP 9.3 : TEM photograph of nano silica

FTIR spectrometry is widely used to prove the formation of silica network (Figure CBP 9.2). The major peak at about 1100 cm^{-1}, that is attributed to the asymmetric stretching vibrations of Si-O-Si bonds of silica. The FTIR spectrum did not show absorption bands due to removal of -O-H bond stretching at 3480 cm^{-1} as well as typical absorption bands for Si-O-Si network vibrations at 1130 and 823 cm^{-1}. The characteristic absorption band of Si-O-Si asymmetric stretching (1130 cm-1) became stronger and moved to higher wave number (1180 cm^{-1}) indicating the condensed silica network (-Si-O-Si-).

TEM photograph of the SiO_2 nanoparticle implied that shape of the nanoparticles are nearly spherical shape without smooth and clean surfaces with flaws due to presence of impurities (Figure CBP 9.3). Selected area electron diffraction (SAED) pattern shows that silica nanparticle synthesized by this novel method is amorphous in nature. By using ImageJ software, the mean diameter of the silica nano particle is observed as 16.54nm.

Application of $Si(OH)_4$ nano sol for water repellency

After synthesis of nano $Si(OH)_4$ sol, they have been diluted to 1% stock solution and used for application on jute fabric by exhaustion as well as pad→dry→cure method. 1% Nano silica was applied on jute fabric at 95°C, 1:20 MLR, 60 minutes, pH 7-8 and dried without washing. Similarly 1% nano silica sol was nipped two times with jute fabric followed by drying at 90°C, 60 minutes and curing at 130°C for 5 minutes. The wetting time and wicking height (after 5 minutes) of nano silica applied jute fabric were evaluated and it did not meet the commercial standard (> 360 sec). It might be due to presence of nano silica in the form of Si-$(OH)_4$ which obviously absorbs the water/moisture. In the pad→dry→cure method, the water repellency is better than exhaustion method, due to partial conversion of Si-$(OH)_4$ nano sol to silica nanoparticle, which is also confirmed by EDX.

SEM with EDX of $Si(OH)_4$ nano sol applied jute fabric

EDX method is used to confirm the presence of SiO_2 / Si-$(OH)_4$ nano particle on the surface of a fibre. EDX data confirmed the presence of silicon element in all samples and SEM images further confirmed the existence of silica nano particle on the surface of jute fibre. SEM images also inferred that dispersion of nano silica on the surface of the jute fibre is more in the pad→ dry→cure method (2.50%) than exhaustion method (0.97%), since during curing nano Si-$(OH)_4$ sol , it is partially converted to nano silica. The amount of oxygen element is increased from 41.6% to 48.4 and 47.5% respectively, which further confirmed the presence of silica nano particle on the surface of the jute fibre.

FTIR of nano silica applied jute fabric

FTIR Spectra inferred that nano silica sol applied jute fibre shown slight difference against control jute fibre (Figure 9.4). The additional peak at 1100, 823 and 882 cm^{-1} in the spectrum may be due to typical absorption bands for Si-O-Si network vibrations and Si-OH bond stretching respectively. Since the formation of bonding between nano silica and amorphous region of the jute fibre is limited, no appreciable change has been observed for other peaks marked.

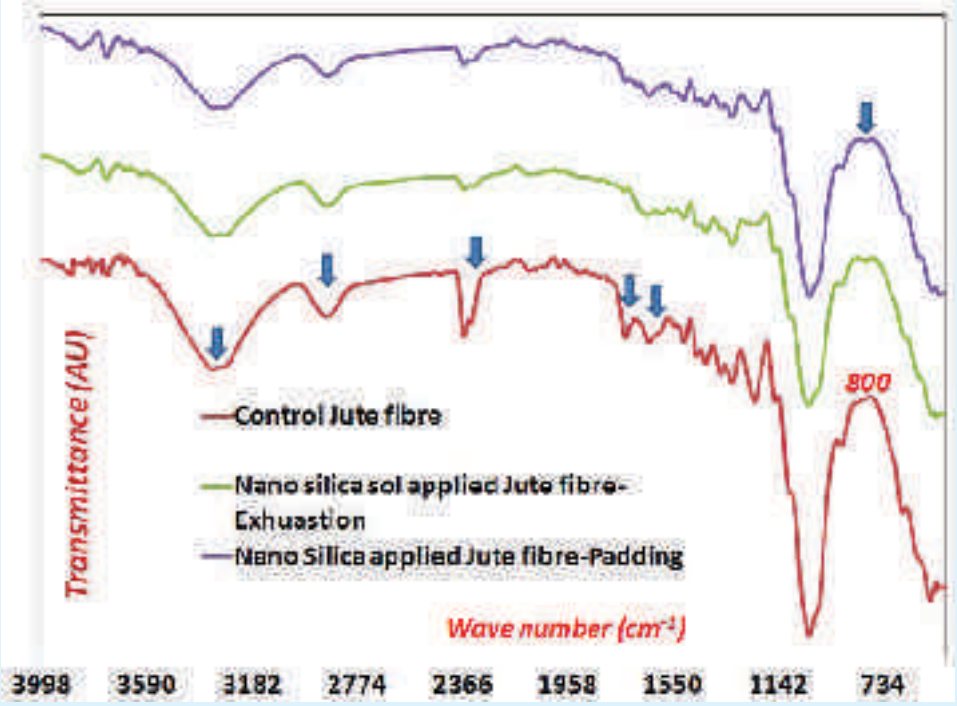


Figure - CBP 9.4: FTIR Spectra of SiO_2 finished jute fibre

Application of silica nano particle followed by polysiloxane polymer

Nano silica sol in four different concentrations (0.10, 0.25, 0.50 and 1.0% owf) was applied on jute fabric by pad (100% expression) → dry (104°C/60minutes) → cure method (130,140,150 & 160°C /5 minutes). After application of nano silica, the treated fabrics were finished with 10 gpl Ceraperm-TOWI (nano polysiloxane pre-polymer) by pad (100% expression) → dry (104°C/ 60minutes) → cure method (150°C/5 minutes). After finishing water absorbency (sec) of the finished samples were evaluated. It inferred that conversion of nano silica sol into nano silica network happen at high temperature, and the subsequent polysiloxane finishing capped the nano silica network, so that there is a improvement in water repellent property. However, this combination finish did not meet the commercial standard.

Optimization of silica nano particle based water repellent finish

Nano $Si(OH)_4$ sol in six different concentrations (0.10, 0.25, 0.50 , 1.0, 2.0 & 5.0% owf) was applied on jute fabric by pad (100% expression) → dry (104°C/60minutes) → cure method (150°C/5 minutes). After application of nano silica, the treated fabrics were finished with 20 gpl NUVA 2114 (commercial water repellent chemical) by pad (100% expression) → dry (104°C/ 60minutes) → cure method (150°C/5 minutes). After finishing, water absorbency (sec), contact angle (°) , spray test, SEM with EDX , bending length, tensile strength and FTIR spectra were evaluated

Handle and mechanical properties of nano silica + NUVA finished jute fabric

Handle property and mechanical property of finished jute fabrics are given the table 9.4.

Table - CBP 9.4: Handle and tensile property of nano silica based finished jute fabric

Finishing	Amount of nano SiO_2 (%)	Bending length (mm)	Flexural rigidity (µNm)	Tenacity (cN/Tex)	Initial modulus (N/m^2)
Control	--	20.8	34.8	4.37	187
Nano SiO_2	0.10	16.6	16.7	3.25	200
	0.25	16.5	17.8	3.13	278
	5.0	16.7	18.6	2.64	303
Nano SiO_2 + NUVA (20gpl)	0.10	15.6	15.0	3.78	258
	0.25	15.9	15.5	3.46	322
	5.0	16.1	16.4	3.01	366
NUVA (20gpl)	--	16.5	17.3	3.90	333

Results inferred that after nano silica treatment or water repellent finishing bending length and flexural rigidity of the jute fabrics are reduced drastically due to padding process. However, NUVA polymer has also influence to soften the cellulose fibril of the jute fibre which further enhances the handle. It is also noticed that increasing in nano silica concentration, the handle is slightly reduced. Due to thermal treatment involved in the finishing, there is drastic reduction in the tenacity of the jute fabric. The rate of reduction in tenacity is 26, 14, & 11% on nano silica, nano SiO_2+NUVA and NUVA finished jute fabric respectively. However the initial moduli of the finished fabrics are increased with increase in concentration of nano SiO_2 which may be due to increase in stiffness of the cellulose polymer due to Si-O-Si condensed network.

Water repellency of nano silica + WRF finished jute fabric

Water repellency of finished textiles can be assessed by Spray Test as per ISO 4920 method, in which the 100mm diameter fabric was framed and placed at 45° inclination. Above the samples, water container was placed 15cm above the sample. 8 oz of distilled water poured from the container to the sample. The rate of wetting and sticking of the water droplets on the surface of the finished fabrics were assessed manually and grades can be given. Grade above 80 can be acceptable for the commercial water repellent finish.

Table - CBP 9.5: Water repellent properties of different finished jute fabric

Finishing	Amount of nano SiO_2 (%)	Wettability (Sec)	Spray test rating	Visual assessment
Control	--	<2	< 50	Total wetting of upper and lower surface of jute fabric
Nano SiO_2	0.10	35	50	Complete wetting of whole upper surface of jute fabric
	0.25	43	50	
	5.00	< 20	50	
Nano SiO_2 + NUVA (20gpl)	0.10	> 360	90*	Slight random sticking or wetting of upper surface of jute fabric
	0.25	> 360	90*	
	5.00	> 360	90*	
NUVA (20gpl)	--	> 360	80	Wetting of upper surface at spray points of jute fabric

**- Desirable water repellent finish with absorption of less amount of moisture than NUVA finish*

Table CBP 9.5 results inferred that 20 gpl NUVA could be impart commercial water repellent finishing, however nano-composite application using Nano SiO_2+ NUVA 2114 enhance further water repellency grade from 80 to 90. It is indicated that nano silica network form projected area on the surface of the jute fibers and subsequent NUVA polymer capped the silica nanoparticle network which forms partial lotus surface like finishing on the surface of the jute fibre, so that there is improvement in water repellency.

0.25% + Nano silica applied jute fibre | 20 gpl NUVA 2114 finished jute fibre | Nano Silica (0.25%) + 20gpl NUVA 2114 applied jute fibre

Figure - CBP 9.5: Spray test photograph of finished jute fabric

SEM analysis inferred that only nano silica applied jute fibre has widespread silica nanoparticle, while NUVA polymer spread and cover all grooves of the jute fibre, which ultimately responsible for rolling of water molecule on the surface of the jute fibre. In nano silica followed by NUVA finished jute fibre has partial projected lotus like area which are responsible for improvement in the water repellency of the jute fabric.

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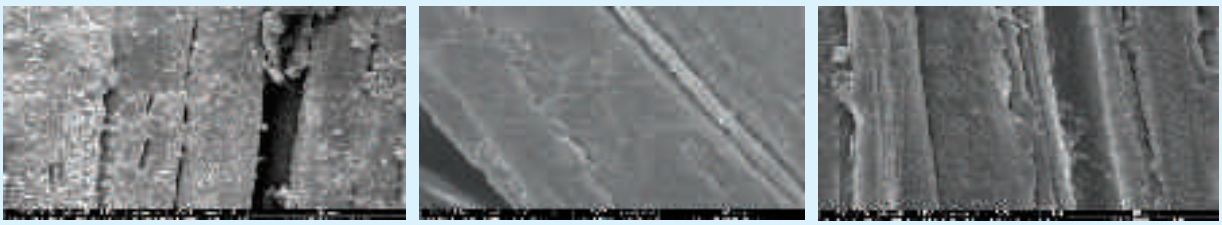

0.25% Nano silica applied jute fibre | 20 gpl NUVA 2114 finished jute fibre | Nano Silica (0.25%) + 20gpl NUVA 2114 applied jute fibre

Figure - CBP 9.6: SEM photograph of finished jute fabric

Durability of nano-composite finished jute fabric

Accelerated washing test for nano silica treated jute fabric was carried as per AATCC 61-2006 (Test method 3A) method, in which one accelerated washing is equivalent to five home commercial laundering. Results inferred that nano silica did not form strong bonding with jute fibre, so that after five home laundering, the water repellent property is drastically reduced in all concentrations. Nano SiO_2+ 20gpl NUVA 2114 combined

finishing on jute fabric in all concentration withstand up to five washes. The effect of Nano SiO_2 in the 0.25% Nano SiO_2+ 20gpl NUVA 2114 combination with respect accelerated washings was studied up to 25 washes. Results inferred that combinations withstand up to 10 home laundering (>360sec), after that there is drastic reduction in the water repellency (<300 sec).

Table - CBP 9.6: Wettability of finished jute fabric before and after accelerated washing (Sec)

Concentration of Nano SiO_2 (%)	*0.10*	*0.25*	*0.50*	*1.0*	*2.0*	*5.0*
Only Nano SiO_2 finishing	35	57	43	34	23	< 20
Only Nano SiO_2 finishing-After five home laundering	< 2	< 2	< 2	< 2	< 2	< 2
Nano SiO_2+ 20gpl NUVA 2114	>360	>360	>360	>360	>360	>360
Nano SiO_2+ 20gpl NUVA 2114-After 5 home laundering	>360	>360	>360	>360	>360	>360

Optimum nanoparticle based water repellent finish

From the above results, it is concluded that the following processing condition could be able to impart desirable water repellent finish on jute fabric. 0.25% Nano $Si(OH)_4$ sol application by pad (2 dip & 2 nip with 100% Expression) → dry (105°C/ 30 minutes) → cure (150°C/3 minutes) followed by finishing with 20 gpl NUVA 2114 by pad (2 dip & 2 nip with 100% Expression) → dry (105°C/ 30 minutes) → cure (150°C/3 minutes) method would gave water repellency grade of 90 (Spray test) & water absorbency of >360sec. This finish could be withstood up to ten home launderings.

Flame Retardant Finishing of jute textile by Zinc Oxide Nanoparticle

Identification of flame retardant nano particle

It is identified that nano ZnO can be easily synthesized by wet chemical method i.e. alkaline hydrolysis of respective metallic salts at ambient condition. By considering the ease of synthesis and % yield, ZnO is selected as a suitable nano particle for jute textiles to impart flame retardancy.]

Chemical synthesis of flame retardant nano particle

0.12 M of sodium carbonate solution was slowly added to 0.1M of zinc nitrate hexahydrate solution in ten minutes followed by continuous stirring for 60 minutes using magnetic stirrer. After 60 minutes, zinc nitrate is converted into $Zn(OH)_2$. The nano $Zn(OH)_2$ sol was then dried at 90°C for 2 hour in order to remove water, followed by calcination at 400°C for 2 hours. The yield of nano ZnO is 48% and the respective chemical reactions are given below.

$$Zn(NO_3)_2 + Na_2CO_3 \rightarrow 2\,NaNO_3 + ZnCO_3$$
$$ZnCO_3 + 2H_2O \rightarrow H_2CO_3 + Zn(OH)_2$$
$$Zn(OH)_2 \rightarrow ZnO + H_2O$$

The stability of $Zn(OH)_2$ sol in different solvents like polyvinylpyrrolidone, starch, polyvinyl alcohol & ethylene glycol were studied for direct application on jute fabric.

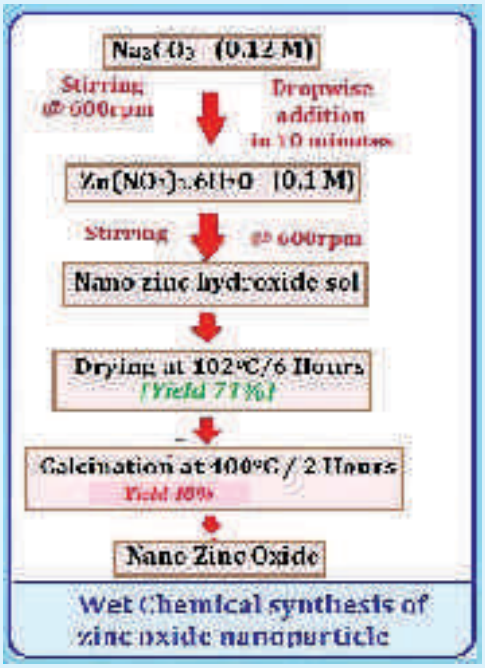

Figure - CBP 9.7: Synthesis of Nano ZnO

Characterization of nano ZnO

The nano $Zn(OH)_2$ sol and nano ZnO is characterized by UV-Visible Spectroscopy (UV-VIS) and transmission electron microscopy (TEM). UV-VIS spectroscopy of synthesized nano silica sol gave max at 320 nm which confirmed the presence of nano zinc hydroxide.

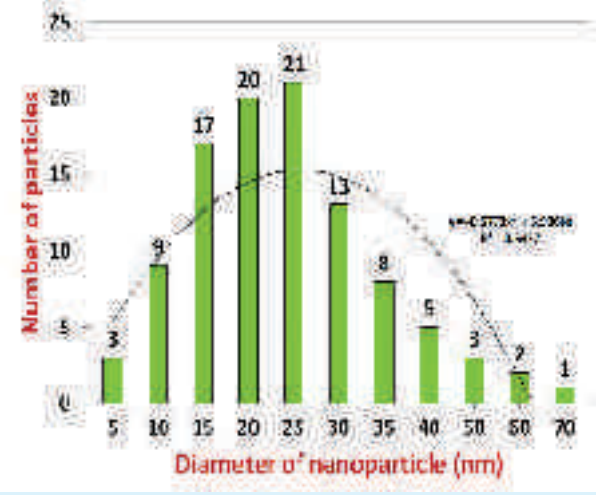

Figure - CBP 9.8: Particle size distribution of nano ZnO

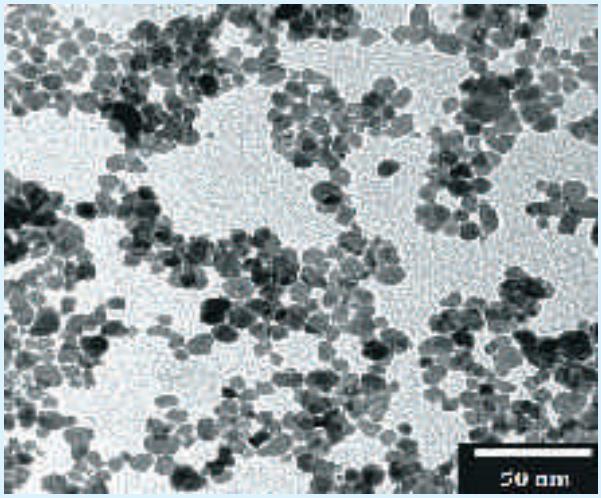

Figure - CBP 9.9: TEM photograph of nano ZnO

TEM photograph of the ZnO nanoparticle implied that shape of the nanoparticles are nearly spherical shape with smooth and clean surfaces without flaws (Figure CBP 9.9). By using ImageJ software, the mean diameter of ZnO nano particle diameter is observed as 24.5nm.

CBP 10 Eco-friendly printing of jute with natural dyes

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

Development of printed jute fabrics by natural dyes using substantive and pigment printing method with improved fastness characteristics is the main objective of this project.

Procurement of jute fabric, natural dyes, chemicals, auxiliaries and printing screens of different mesh size were done and following treatments were carried out:

i. **Scouring & bleaching**

Scouring and bleaching of the jute fabric was carried out. The optical properties of bleached jute fabric was evaluated. They are whiteness index (HUNTER) 79.22, Yellowness Index (ASTM D-1925) 16.63 and Brightness Index (TAPPI 452) 59.71.

ii. **Printing of double mordanted jute fabric by natural dye extracted by aqueous extraction method**

Scoured bleached jute fabric was treated with myrobolan extract and then padded with potash alum solution, dried in air. Print paste was prepared using guar gum, urea, manjistha and printed on mordanted fabric. The printed fabric after drying was steamed at 100°C.

Figure CBP 10.1 : Printed jute fabric using Mangistha

Figure CBP 10.2 : Printed jute fabric using Annatto

iii. **Printing of single mordanted jute fabric by natural dye extracted by aqueous extraction method**

Scoured and bleached jute fabric was padded with potash alum/ ferrous sulphate and dried. The fabric was then printed with print paste prepared from thickener, urea and natural dye. The printed fabric after drying was steamed at 110°C for three minutes, dried, washed and dried again.

iv. **Natural dye**

Preparation of natural dye in powder and paste form
Manjistha - 11.7% yield
Annato - 29.64% yield

v. **Printing of double mordanted jute fabric with natural dye in powder or paste form**

Scoured - bleached - double mordanted jute fabric was printed with print paste (guar gum, urea, powder dye). The printed fabric is dried and steamed at 110°C for 30 min. again dried.

vi. **Printing of bleached jute fabric with natural dyes (powder/ paste form) by pigment printing process using three different screen with different mesh size**

The scoured and bleached jute fabric was printed with print paste prepared from dye powder, mordant (Alum/ferrous sulphate), thickener, urea, fixer, catalyst (Ammonium hydrogen orthophosphate). Three different printing screen with different mesh size was used. The printed fabric was steamed at 120°C for 30 minutes, dried, washed, dried.

Evaluation

Pigment printed jute fabric samples were produced by using three different designs like CROSS, GANESH IDOL & HORSE. For each design three mesh sizes like 20, 40 & 60 were used. All the samples were evaluated for optical, wash fastness & rubbing fastness properties and results have been tabulated in Table-CBP10.1 & Table-CBP10.2.

Table - CBP 10.1 : Effect of mesh size on pigment printed jute fabric using natural dye extracted from manjistha.

Design	Mesh size	K/S value	L	a	b	Wash fastness	Rubbing fastness	
							Dry	Wet
Cross	20	2.98	55.34	12.66	18.19	3	5	4-5
Cross	40	3.09	55.49	12.32	18.23	3	5	4-5
Cross	60	2.76	57.48	10.40	19.37	2	5	4-5
Ganesh	20	2.94	53.03	15.96	15.26	-	-	-
Ganesh	40	3.37	52.87	17.44	15.60	-	-	-
Ganesh	60	2.41	53.22	16.64	15.36	-	-	-
Horse	20	3.01	53.73	17.77	18.18	-	-	-
Horse	40	3.37	54.64	18.49	19.24	-	-	-
Horse	60	3.09	54.61	17.39	19.18	-	-	-

Table - CBP 10.2: Effect of mesh size on pigment printed jute fabric using natural dye extracted from annatto.

Design	Mesh size	K/S value	L	a	b	Wash fastness	Rubbing fastness	
							Dry	Wet
Cross	20	4.28	61.53	14.26	35.36	2-3	4	3-4
Cross	40	4.61	61.45	15.09	36.89	2-3	4	4
Cross	60	4.60	61.40	16.12	37.57	2	4	3-4
Ganesh	20	3.94	62.15	20.42	38.41	-	-	-
Ganesh	40	4.71	62.53	18.77	37.96	-	-	-
Ganesh	60	4.06	62.43	18.06	37.63	-	-	-
Horse	20	4.86	58.75	19.54	37.65	-	-	-
Horse	40	4.95	60.54	19.21	39.43	-	-	-
Horse	60	3.45	58.76	18.16	36.51	-	-	-

Findings

- Printing of single or double mordanted jute fabric using manjistha and annatto dyes is encouraging and natural dyes when used in powder or paste form produces better result.
- Printing of natural dyes on bleached jute fabric by pigment printing process produces bright colour and sharp outline. Evaluation of samples reveal that colour strength produced by all the three mesh sizes are good but the mesh size 40 produced the best result.
- Wet and dry rubbing fastness are excellent in case of printed jute fabric using manjistha while it is good in case of annatto.

CBP 11 Development of jute pulp for making tissue paper and sanitary napkins

Dr. A. K. Roy, Dr. S. N. Chattopadhyay & Sh. S. Bhowmick

A sanitary napkin basically comprises of three layers; top layer, absorbent layer and barrier sheet. The absorbent layer is the key component of the napkin (cellulose pulp) and the extent to which this layer is able to absorb and retain the fluid determines the efficiency of the napkin. The main aim of this project is to develop sanitary napkin from jute cellulose, as an alternative to wood pulp.

Jute stick and jute fibre were used for making absorbent pulp. Jute sticks were broken into small pieces while jute fibres were cut into small lengths (1-2") and used for pulping. Chemical composition of jute stick and jute fibres were evaluated and tabulated in Table-CBP11.1.

Table - CBP 11.1: Chemical composition of jute stick and jute fibres

Raw material	α-Cellulose	Hemicellulose	Holocellulose	Lignin
Jute fibre	66.6	19.8	86.4	12.6
Jute stick	40.1	22.3	62.4	22.1

Pulping of jute stick was carried out following Alkaline Sulphite Anthraquinone Methanol (ASAM) process at 1600C in a rotary digester for 3 hours. The pulps were washed thoroughly and yield was estimated. The pulp was bleached with hydrogen peroxide at 85-900C temperatures for 2 hours, washed and yield was estimated. The yield and optical properties of the pulps are tabulated in Table-CBP11.2.

Table - CBP 11.2: Yield and optical properties of the pulp produced from jute stick

Pulp	Yield (%)	Whiteness Index (HUNTER)
Jute stick pulp (unbleached)	52.0	46.92
Jute stick pulp (bleached)	49.0	65.58

Jute fibres were processed by ASAM pulping at two different temperatures (1600C & 1150C) and also by 2% sodium hydroxide pulping at 1150C in a rotary digester and at 950C by open digestion. All these pulps were bleached with hydrogen peroxide at 85-900C temperatures to produce white absorbent pulp. The pulp yield in each case was determined and whiteness index was also evaluated. The results are tabulated in Table-CBP11.3.

Table - CBP 11.3: Yield and optical properties of the pulp produced from jute fibres

Jute pulp	Pulping process	Bleached (B) / Unbleached(UB)	Yield (%)	Whiteness Index (HUNTER)
Jute fibre	ASAM, 160°C	UB	59.3	58.80
Do	ASAM, 160°C	B	57.2	88.27
Do	ASAM, 115°C	UB	79.2	53.63
Do	ASAM, 115°C	B	74.4	82.24
Do	Soda, 115°C	UB	51.3	-
Do	Soda, 95°C	UB	56.1	-

Both unbleached and bleached pulps produced from jute stick as well as jute fibres were made into small pieces by disintegrator and passed through 2 mesh screen. Now the pulps are thoroughly blended with 2-4% Super Absorbent Polymer (SAP). About 12 gms material were pressed in a dice at 30-40 kg/cm2 pressure and converted into mat of disposable napkins of 20 cm /7.5 cm /1.5 cm size. The napkins thus produced were subjected to BIS Test (IS: 5405-1981) to determine the extent to which it is able to absorb and retain the fluid which measures the efficacy of the napkins. The results of evaluation are tabulated in Table - CBP 11.4.

Table - CBP 11.4: Evaluation of area of absorption of sanitary napkins produced from jute pulps

Pulp	Pulping process	Bleached (B) / Unbleached (UB)	Area of absorption	
			After 1 min	After 10 min
Jute fibre	ASAM, 160^{0}C	UB	5×5, not good	6×6
Do	ASAM, 160^{0}C	B	6.3×7, good	6×6
Do	ASAM, 115^{0}C	UB	5.3×5.5, poor	6.3×8
Do	ASAM, 115^{0}C	B	6.5×8.5, mod. good	6.5×8.9
Do	Soda, 115^{0}C	UB	6×7.4, poor	6.4×7.9
Do	Soda, 95^{0}C	UB	Very poor	
Jute stick	ASAM, 160^{0}C	UB	Very poor	
Do	ASAM, 160^{0}C	B	Very poor	

Findings

It was found that bleached jute pulp made by ASAM process at 115°C produces high yield and is suitable for making sanitary napkins. The pulps produced from jute stick by Alkaline Sulphite Anthraquinone Methanol (ASAM) process are not suitable for this purpose.

Transfer of Technology Division

Priority areas of research

- Design, development and dissemination of jute based decorative fabric.
- Studies on techno-economic constraints and opportunity of jute diversified products manufacturing.
- Training through established institutions under HRD scheme sanctioned by Development Commissioner (Handicrafts), Ministry of Textiles, Government of India.

Achievements

- Techno-economic constraints analysis in jute diversified products (JDP) manufacturing reveals that manufacturing of jute diversified products is highly seasonal in nature. The inadequate and not-in-time supply of raw materials and ingredients without taking help of middlemen / associations / NGOs / Federations hinders the progress of their unit. Government intervention is very much required for further development and growth of JDP manufacturing in the form of availability of raw materials, bank loan and subsidy.
- The ribbons / barks peeling capacity of newly developed NIRJAFT Power Ribboner with single feeding chute and double feeding chute are within 75-85 kg/h and 150-170 kg/h of green biomass respectively.
- Fancy jute covered yarn/mat stick based ornamental fabric were developed which may be used as floor mats, file folder and shopping bag.

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

Dr. S. B. Roy

This project aims to study the trends in export of jute diversified products (JDP) and assess the resource use efficiency in JDP manufacturing. Moreover, it will investigate the technological and economic problems faced by jute entrepreneurs in production and marketing of JDP in decentralized sector.

Trend analysis & forecasting of JDP Export:

Prepared monograph on "Trends in Jute Diversified Products manufacturing in India", based on the relative performance of JDP export in total jute products export observed during last decade.

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

Choosing the Best Trend line for our data:

When we add a trend line to a chart, we can choose any of the six trend/ regression types - linear, logarithmic, polynomial, power, exponential, and moving average.

- Linear - increasing or decreasing at a steady rate
- Logarithmic - increases or decreases quickly
- Polynomial - data fluctuates
- Power - increase at a specific rate
- Exponential - rise or fall at increasingly higher rates and
- Moving average - smoothes out the fluctuations

The type of data determines the type of trend line we should use. We shall choose a trend line that is reliable. A trend line is most reliable when its R-square value is at or near 1.

Survey Questionnaire Modification:

Structured questionnaire were developed to study techno-economic constraints of JDP manufacturing. In this regard, pilot scale survey work was carried out with the developed questionnaire and analysed the data to get an insight of the study result against the project objectives. Based on the pilot scale survey work results and recommendation of Research Advisory Committee as well as experts opinion the structured survey questionnaire were modified considering stakeholders input in decentralized sector from grass root level. Four numbers of Association/ NGOs/ Federations of jute entrepreneurs were consulted at grass root level in decentralized sector.

Data Collection:

For identifying the constraints of JDP manufacturing, producer level primary data were collected from selected JDP entrepreneurs from four districts namely, North 24 Parganas, Nadia, Murshidabad and Paschim Medinipur for the year 2014-15 with the help of pre-tested survey questionnaire.

Four numbers of Association/ NGOs/ Federations are involved in the primary data collection.

- Balivara OFFER, North 24 Parganas
- Vivekananda Mission, Nadia & Murshidabad
- Chaplin Club, Paschim Medinipur
- ANKUR - Federation of Jute WSHG, North 24 Parganas

Sampling Design:

From North 24 Paraganas, 60 numbers of jute entrepreneurs were selected for sample survey from different women Self Help Group (WSHG) based on the total populations of JDP entrepreneurs. From Nadia and Murshidabad districts, 20 number of jute entrepreneurs were selected from each district for sample survey from different women Self Help Group (WSHG) based on the total populations of JDP entrepreneurs. Whereas, from Paschim Medinipur, 100 number of jute entrepreneurs were selected for sample survey from different women Self Help Group (WSHG) based on the total populations of JDP entrepreneurs.

Figure TOT 7.1: Some JDP samples

Table TOT 7.1: Detailed district wise sample survey information for data collection

District & Area	Items	Numbers
North 24 Parganas		
Palashi – WSHG	Jute Handicrafts	10
Haroa – WSHG	Jute Bag	10
Halisahar – WSHG	Jute Bag & Handicrafts	10
Deganga – WSHG	Jute Bag	10
Khardah – WSHG	Jute Jewelry	10
Naihati – WSHG	Jute Bag	10
Sub-Total		60
Nadia		
Krishna Nagar – WSHG (Sarada Mahila SHG	Fancy Jute Bags	10
Ranaghat-I – WSHG (Kalpataru Mahila SHG)	Jute Handlooms	10
Sub-Total		20
Murshidabad		
Beldanga-II – WSHG (Jutesree Mahila SHG)	Jute Handicrafts	10
Berhampur – WSHG (Srima Jute Mahila SHG)	Jute Handicrafts	10
Sub Total		20
Paschim Medinipur		
Debra – WSHG	Jute Mats	50
Sadar – WSHG	Jute Handicrafts	10
Daspur – WSHG	Jute Bag	10
Dharma – WSHG	Jute Handicrafts	10
Rupnarayan-I – WSHG	Jute Handicrafts	10
Rupnarayan-II – WSHG	Jute Handicrafts	10
Sub Total		100
Grand Total		**200**

Thus the total number of samples for the study were 200.

Techno-Economic Constraints Analysis:

Important constraints in JDP manufacturing as perceived by the JDP manufacturers at grass root level were identified from four districts namely, North 24 Parganas, Nadia, Murshidabad and Paschim Medinipur for the year 2014-15 and presented in the following sub sectors.

1. Agro-climatic Constraints

Some of the agro-climatic factors such as weather conditions and seasonality are affecting on the production performance of JDP manufacturers. The agro-climatic constraints of JDP manufacturing are given in the following table.

Table TOT 7.2: Agro-climatic Constraints

Parameters	Options	Nos.	%
Weather Conditions	Favourable	182	91
	Unfavourable	18	9
Seasonality	High	124	62
	Low	76	38

A perusal of the table shows that most of the JDP manufacturers found favourable weather conditions for production of JDP whereas, 62 per cent of selected sample JDP manufacturers reported high seasonality of the JDP manufacturing.

2. Technological Constraints

In this section, the technological factors responsible for low production of JDP manufacturing are discussed. In the first part of this discussion the awareness and knowledge of the JDP manufacturers about technology is elaborated, later availability of important technological inputs are examined.

Table TOT 7.3 : Technological constraints inhibiting JDP manufacturing.

Parameters	Options	Nos	%
Raw Materials	High Quality	78	39
	Medium Quality	98	49
	Low Quality	24	12
Ingredients	Local Market	30	15
	Middlemen	170	85
Infrastructure	Favourable	88	44
	Unfavourable	112	56
Skilled Workers	Adequate	96	48
	Inadequate	104	52
Skill Development Scope	Sufficient	98	49
	Insufficient	102	51
Technical Support	Available	90	45
	Unavailable	110	55

Most of JDP manufacturers were acquired sufficient technological know-how through trainings and skill development programmes. It is evident from the table that raw materials of medium quality to produce JDP is used by 49 per cent JDP manufacturers whereas 39 per cent were using high quality raw materials. Ingredients are generally collected through middleman as they are not available in the local market. Inadequate supply of skilled workers hindering the adoption of modern technology. There were limited scope for development in skills due to socio-economic conditions of JDP manufacturers.

3. Availability of Technological Inputs Constraints

Awareness and knowledge about the technological components are not only the important factors but the availability of the technical inputs such as raw materials, ingredients, skill workers, design and technical supports are also affecting on the production of quality JDP. Questions were asked to the selected JDP manufacturers on this aspects and their reactions are presented in the following table.

Table TOT 7.4: Responses of JDP manufacturers

Parameters	In Time		Not in Time		Adequate		Inadequate	
	Nos	%	Nos	%	Nos	%	Nos	%
Raw Jute	132	66	68	34	144	72	56	28
Ingredients	120	60	80	40	180	90	20	10
Skilled Workers	134	67	66	33	96	48	104	52
Design	124	62	76	38	76	38	124	62
Technical Support	96	48	104	52	68	34	132	66

Most of the JDP manufacturers reported raw materials are available adequately and in time as long as they are associated with association/ NGOs/ Federations. Similarly the ingredients also available in time adequately as the supply is made through the middleman. There is shortage of skilled workers in the pick seasons of production. Technical supports are available in time but inadequately.

From the foregoing discussion, it is clear that lack of availability of technological inputs in time on adequate amount and unawareness of improved technological practices among the JDP manufacturers are the major constraints for stagnation of JDP manufacturing.

4. Economic/ Financial Constraints

With the introduction of modern technology and practices of JDP manufacturing become more capital intensive and thus needs more funds for their production.

Table TOT 7.5 : Different economic and financial constraints perceived by the sample JDP manufacturers.

Parameters	Options	Nos	%
Bank Loan	Available	90	45
	Unavailable	110	55
Subsidy	Available	76	38
	Unavailable	124	62
Govt. Scheme	Available	84	42
	Unavailable	116	58
Marketing Assistant	Available	174	87
	Unavailable	26	13

About 55 percent of selected JDP manufacturers reported shortage of funds and 62 per cent told there is no subsidy available for the JDP units. Most of the selected JDP manufacturers feel Government intervention on both bank loan and subsidy availability to JDP producers at grass root level in the decentralized sector. The

result further revealed that about 87 per cent of JDP manufacturers reported marketing assistant are available to sell their produce in different exhibitions organized by Government departments.

Conclusions:

Techno-economic constraints analysis in JDP manufacturing revealed that manufacturing of JDP is highly seasonal in nature. Though they know the technical know-how of the jute diversified products manufacturing the inadequate and not in time supply of raw materials and ingredients without taking help of middleman/ Associations/ NGOs/ Federations hindering progress of their unit. Government intervention is very much required for further development and growth of JDP manufacturing in the form of availability of raw materials, bank loan and subsidy.

TOT 8 Design, development and dissemination of jute based decorative fabric

Dr. A. N. Roy, Dr. S. B. Roy & Sh. K. Mitra

In this project, main aim was to identify/generation of suitable product specific designs and develop the jute based decorative fabric.

Need assessment on the requirement of different jute based decorative fabric has been completed after interaction with existing JDP manufacturers, new entrepreneurs willing to set business on JDP manufacture, weavers, designers and also artisans engaged in similar type of trades using other material e.g., matt weavers, leather product manufacturers etc. This assessment will help in developing jute based fabric of better market prospect. Developed 30 designs suitable for jute/silk and jute/cotton union blended fabric to be used in outer fashion garments. Developed ten jute based decorative fabric (Rs. 120 to Rs 170 per sq. mt) having jute content of minimum 55% for use in light weight winter jackets, slippers, and some ladies outer wear. Developed ten fancy jute covered yarn/mat stick based ornamental fabric which may be used as floor mats and also different value added products. Developed slippers, office bags from jute based ornamental fabric and file folder and shopping bag from jute/mat stick fabric. Lifestyle products like ladies coat (Rs. 900), Sherwani (Rs. 1200) could be developed from jute based decorative fabric (Rs. 140/mt). The fabric shows shrinkage upto 2% on three cold washing with detergent. In an effort of commercialization, one MOA has been signed with Miltex Eco-fibres, Coimbatore, Tamilnadu on the support of technology for the manufacture of jute/silk union blended fabric. An amount of 50 meters of jute/silk light weight fabric has been supplied to Miltex Eco-fibres. Total revenue generated through this effort was Rs. 40,000/-

Ladies coat from ornamental jute fabric

Figure TOT 8.1: Jute Based Decorative Fabric

TOT 9 Comparative evaluation of ribboner developed by NIRJAFT

Dr. V. B. Shambhu, Dr. L. K. Nayak, Mr. S. Das and Mr. P. Sanyal

Natural fibres from the crops like jute, mesta, ramie and sisal are not obtained during harvest of the crop, like cotton. These fibres in their original state are usually tightly bound in the stems of plants (leaf in case of sisal) and must be separated from the woody and gummy substances that bind them together. Fibre separation has to be carried out with much care in order to obtain the best yield and quality of fibre. The bast fibres are extracted by retting of the whole plants. The existing whole plant retting method of jute and mesta for fibre extraction is labour intensive and requires large volume of water. Lack of adequate water very often results in the production of inferior quality fibre at high cost and denies accrual of benefits from variety, improved practices etc. In order to salvage the situation, introduction of mechanization in the process of extraction of fibre is essential.

Evaluated the performance and studied the constraints associated with NIRJAFT manual ribboner, CRIJAF Bast Fibre Extractor, NIRJAFT first generation power ribboner and newly developed NIRJAFT Power Ribboner.The ribbons/ barks peeling capacity of NIRJAFT Manual ribboner was found to be 17.4 kg/h and 144 plants/h on the basis of green biomass and plants number respectively. The drawback associated with this manual ribboner is that a portion (about 230-300 mm) of whole plant from bottom is needed to be beaten or crushed for getting the proper grip during the operation. Accordingly, lot of time and drudgery was involved in this ribboner.

The ribbons/ barks peeling capacity of CRIJAF Bast fibre Extractor was found to be 35.0 kg/h and 320 plants/h on the basis of green biomass and plants number respectively. The drawback associated with this extractor is that both end of the green plant is needed to be fed to this machine for removal of the ribbons. Accordingly, lots of drudgery and draft is required for pulling both the plants & ribbons thus reducing the capacity. Also the jute stick is broken into small pieces and thereby causing entanglement of broken sticks into the ribbons. Sometimes wrapping of peeled ribbon on and around the rotating rollers was observed during operation. No control over the ribboning roller was observed, resulting human (operator) hazard during feeding operation.

The peeling capacity of NIRJAFT first generation power ribboner couldn't be evaluated due to frequent stoppage of the machine. It was found that wrapping of peeled ribbon on and around the fluted rollers was started from the time the first/ second plant was fed and the rollers were completely wrapped with peeled ribbons within few minutes of operation. Cleaning/ removing of the wrapped ribbons from the rollers become very difficult with the consumption of large human labour and time.

The ribbons/ barks peeling capacity of newly developed NIRJAFT Power Ribboner with single feeding chute and double feeding chute were found within the range of 75-85 kg/h and 150-170 kg/h on the basis of green biomass respectively. On the basis of number of plants the peeling capacity of the machine with single feeding chute and double feeding chute were found as about 705- 780 plants/h and 1410-1560 plants/h respectively. The sticks obtained from this ribboner remained intact.

On the basis of data obtained from the NIRJAFT manual ribboner, CRIJAF Bast Fibre Extractor and newly developed NIRJAFT Power Ribboner, the ratio of ribbon to jute stick was found to be 45:55 on weight basis.

The ribbons obtained from the ribboners were retted in a tank holding it in vertical position with the help of bamboo or bamboo grid. This vertical steeping of ribbons in low volume of water with less space improved the fibre quality in lesser time.

Figure TOT 9.1 : Newly developed NIRJAFT power ribboner

Figure TOT 9.2 : Ribbon/bark peeling through newly developed NIRJAFT power ribboner

Figure TOT 9.3 : Beating crushing the bottom portion of jute before ribboning

Figure TOT 9.4 : NIRJAFT First generation Power Ribboner

Figure TOT 9.5 : Ribbon/bark peeling through CRIJAF Bast Fibre Extractor

Figure TOT 9.6 : Ribbon/bark peeling through NIRJAFT Manual ribboner

External Sponsored Project

Achievements

- Electronic and microprocessor based integrated instrument for jute grading has been designed and developed.
- Computerized instrument to test bending behaviour of technical textiles with acceptable accuracy has been developed.
- A low cost and user-friendly yarn characterization unit has been developed using opto-sensor and image processing unit to assess the staple yarn in terms of diameter, diameter variation, number of thick/thin places, hairiness indices (hair length index and hair area index) and number of hairs in a single run with acceptable accuracy.
- A microbial culture have been isolated from the local soil and purified for degumming of Ramie. The culture found to be effective enough to remove gum within a period of ten days.
- Nano-polysiloxane coupling agent, Low Molecular Weight Compatibilizing agents and modified resin has been identified for improved properties and envronmental stability of jute based biocomposites.

MM 4/6.2 Development of electronic and microprocessor based integrated instrumentation for jute grading system

Dr. G. Roy

The main objective of this project was to develop an integrated system containing hardware and software to score the grade of the test sample accurately along with the required parameters.

The integrated unit of the system consists the following organs:

1. A hardware/software unit with computer interface to measure and store the value of fineness of the fibre in tex.
2. A hardware and software unit with computer interface to measure and store the strength value of the fibre in gf/tex.
3. A software unit to check the defects present by image processing technique of the scanned image of the fibre.
4. A hardware-software unit to find the density of the fibre.
5. A hardware/software unit with computer interface to measure and store the colour with respect to whiteness value of the fibre.
6. From all of these values, the grade scores and grade of the fibre is computed and displayed using Decision Support System developed.
7. Beside these, the Relative Humidity of the test environment, Moisture Content and Moisture Regain value is always measured and displayed in the digital display.

Though initially only one number of unit has been thought off, but upon developmental stages it was decided that two prototype units will be developed as per the given features:

i. The first unit has been developed using the software MATLAB and with a separate computer as the computation unit.

ii. The second unit has been developed smaller in size and lighter in weight and without using both MATLAB software and separate computer.

These two models developed successfully and the photographs are given below:

Prototype I Prototype II

Figure MM 4. 1: Photographs of the instrument

Advantages of the instruments

- The developed instruments are completely portable and versatile.
- These are integrated systems consisting of built-in hardware and software units.
- Both the units are handy and portable, can be operated from A.C mains or from battery supply.
- From the display terminal the grade of the jute sample will be obtained directly along with the grading parameters.
- These units will be economical and easy to use with respect to different segregated test units used for grading.
- Farmers will be benefited by obtaining proper grade of their jute fibre.

The Developed Units:

In the developed units, prototype I is run using a powerful software MATLAB and a laptop as the computation, display and control unit.

The Root Content must be entered manually at the time of running the experiment. It can not be measured automatically.

All the above parameters are considered to find the proper grade of the fibre.

Sl. No.	Root Content (Manual Entry, %)	Breaking Strength		Colour		Fineness		Defects		Grade	
		Using Conventional Instrument (gm/tex)	Using Integrated Instrument (gm/tex)	Using Conventional Instrument (%)	Using Integrated Instrument (%)	Using Conventional Instrument (tex)	Using Integrated Instrument (tex)	Using Conventional Instrument (%)	Using Integrated Instrument (%)	Using Conventional Instrument	Using Integrated Instrument
1	15	25.1	26.26	35.0	35.65	2.7	2.82	1.5	1.55	TD4	TD4
2	15	29.6	30.4	34.5	35.34	2.78	2.83	1.5	1.47	TD3	TD3
3	15	25.1	27.09	36.0	37.92	2.76	2.81	1.0	1.2	TD4	TD4
4	20	23.2	25.0	33.3	34.51	2.6	2.8	1.5	1.45	TD4	TD4
5	20	21.61	24.94	34.50	34.57	2.58	2.78	1.5	1.35	TD4	TD4
6	20	24.1	25.7	39.61	34.41	2.5	2.76	1.5	1.97	TD4	TD5
7	25	20.2	21.25	33.8	34.31	2.7	2.8	>2	2.6	TD5	TD5
8	15	22.5	23.6	32.8	33.9	2.75	2.78	2.0	1.94	TD5	TD5
9	10	18.6	19.30	33.6	34.29	2.71	2.76	2.0	1.97	TD4	TD5
10	15	21.9	22.4	55	45.4	2.2	2.31	2.0	1.85	TD4	TD4

Prototype I Prototype II

Figure MM 4.1 : Screen output of the Instruments

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, Dr. S. Debnath & Dr. A. Sengupta**

***IIEST, Shibpur, Howrah**

Fabric bending is the deflection on application of load in transverse direction i.e. perpendicular to the surface of fabric. Bending of fabric influences the drape and handle of fabric whereas recovery from bending is a factor in creasing of fabric. Presently, technical textiles have come up in a big way. Therefore, it is felt that there is a need for a testing instrument where rigidity can be determined dynamically in a much simpler, mechanized and computerized way. Hence, an attempt has been made to develop a system to study the complete behaviour of bending specially for technical textiles.

The third prototype of computerized instrument was developed by bending of fabric loop principle either in tensile mode or in compressional mode. This instrument can report the complete information of rigidity of semi-rigid technical textiles i.e. bending stress, bending deflection, bending cycles, bending hysteresis, bending relaxation, bending load-deflection curve etc. No such instrument is available. It can be calibrated very easily. It can be used for wide spectrum of fabric and also can be extended for ropes. Ten various technical textiles have been tested successfully using this instrument. Some refinements and modifications are to be done for final stage of instrument. Patent has been filed. Paper has been presented in two International Conferences. An Institute Industry Interface Workshop has been organized on 12.02.2015 for dissemination and final fine tuning of this instrument.

Table IDP 19.1: Comparison between existing tester and developed tester

	Shirley flexural rigidity tester	Product developed
1	Cantilever principle	Modified hanging loop principle
2	Manual process	Mechanized and computerized
3	No display	Digital display/computerized display
4	Most of the technical textiles including semi-rigid, nonwoven, canvas cloth can not be tested	Semi-rigid fabric, nonwoven, canvas cloth can be tested
5	Static measurement, gives rigidity value for a particular deflection	Dynamic system, gives bending stress value for changing deflection
6	Only bending length data is available	Output is in terms of bending load in specified deflection, rigidity resilience, cyclic curve, deflection left after one cycle. It will provide detailed information compared to existing systems.
7	Calculation required for rigidity value	Manual calculation not required
8	No system of data storage	Data storage available
9	Statistical data not available	Statistical data available
10	Yarn testing not possible	Rope can be tested

Conclusion

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

Figure IDP 19.1 - Flexural rigidity tester with precessing, storing & printing devices

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

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*** IIEST, Shibpur, Howrah**

As the sensing technology is highly dependent on the illumination level, constant illumination has to be provided during test by placing the camera in closed chamber. The developed instrument is expected to be acceptable by the user because of its accuracy, much lower cost and user-friendliness. The system is equally useful for coloured yarns with change of background. Patent has been filed. An Institute Industry Interface Workshop has been organized on 12.02.2015 for dissemination and final fine tuning of this instrument.
Irregularity (variation in linear density or diameter) and hairiness (presence of looped and protruding fibres released) of yarn are two most important parameters to judge its quality, which in effect monitor the feel, look and price of a knitted fabric. So, these parameters are to be sensed and kept within control in different textile industry, spinning industry in particular. The existing system mostly used in industry for this purpose employs parallel plate capacitor for sensing mass variation and diffracted light as a measure of hairiness. But there are some serious drawbacks of the existing one like i) exorbitant cost, ii) temperature and humidity dependence of capacitor response, iii) performance degradation due to ageing, iv) lower resolution etc. Hence, a dual sensor system has been attempted to design and develop for complete understanding of irregularity, imperfection and hair of yarn.

A yarn characterization unit has been developed using opto sensor and image processing unit.

The image processing is used to

(1) characterise the staple yarn in terms of diameter, diameter variation, number of thick/thin places and neps, hairiness indices (hair length index and hair area index) and number of hairs in a single run.

(2) provide the accurate measurement of yarn parameters eliminating the discrepancies arrived by existing capacitive one.

(3) measure yarn parameters in moving state. It is slower in its present form due to lower speed of capturing the image by the camera used and can be enhanced using a camera with higher frame per sec (fps) and employing faster processor, as in the present study, the image is getting blared after speed more than 20 m/min.

(4) depict the complete information about hairiness whereas other commercial instruments give either hair count or hair index.

(5) alter the resolution of the instrument by varying the number of slices cut from a single snap using software only.

(6) furnish diameter variation excluding hairs as irregularity measure. But the capacitive testers include mass of hairs in irregularity measurement. Hence image processing shows better representation of unevenness.

(7) detect thick/thin places in terms of any threshold set by the user depending upon their requirement.

(8) develop tester free from electromagnetic interference and/or radio frequency interference.

(9) develop instrument in much lower price than its commercial counterpart.

Table IDP 25.1: Comparison between the existing instrument and developed instrument

Sl. No.	Existing tester for unevenness/hairiness measurement	New Product developed
1	Measure mass variation as irregularity measure. The yarn with same diameter but different density of fibre may produce different mass, may not be identified.	Directly measure the diameter variation.
2	Resolution Poor.	Flexible resolution.
3	Change in temperature and humidity affects the response.	No change of response with change of humidity and temperature.
4	Either hairiness or hair count available	Both hairiness and hair count, i.e. entire distribution of hairs available.
5	Huge cost involvement	Less costly
6	Single sensing	Dual sensing
7	Much faster	Slower with present setup

Conclusion

The developed instrument is user friendly and fully computerised except mounting the yarns. Diameter measurement in real world unit is available unlike existing one. Suitable for multi coloured yarn. Presence of any impurities in the yarn is easily detectable.

Technical Personnel Trained (Numbers): Three
Research Publications in the conference proceedings arising out of the project: Four

Figure IDP 25.1 - Yarn characterisation Unit

FQ3029 Jute based bio-composites for industry

Dr. L. Ammayappan, Dr. S. Debnath, Dr. D. P. Ray & Dr. R. K. Ghosh

The utility of composite is well known. Researches are going on to introduce the low cost natural reinforcing material for certain end uses. Hereby, an attempt has been made to modify the jute textiles and matrix polymers by physico-chemical methods for improved processability and performance of jute based bio-composite.

Nano-polysiloxane as a coupling agent

Commercial nano polysiloxane emulsion (Ceraperm TOWI of M/s Clariant Chemicals Pvt Ltd., Mumbai) was applied to jute fabric in six different concentrations i.e. 0.05, 0.1, 0.5, 1.0, 2.0 & 5.0% (owf) by exhaustion method at pH 6/ 50°C / 1: 20 MLR/ 60 minutes. Nano polysiloxane (NPS) modified jute fabric was used for preparation of jute based biocomposites (21 sheets) and evaluated for their mechanical properties.

Table FQ3029.1: Tensile property of nano polysiloxane treated jute fabric

NPS conc (%)	*Tenacity (cN / Tex)*	*% CV*	*Tensile Modulus (N/mm^2)*	*% CV*	*Tensile Strain (%)*	*% CV*
Control	3.8	10.2	11.1	6.0	2.1	10.0
0.05%	4.2	11.3	13.9	5.7	1.9	9.0
0.10%	4.8	10.4	16.4	5.0	2.0	8.2
0.50%	4.4	8.9	14.2	6.5	1.9	10.5
1.0%	4.3	7.0	12.8	6.0	2.2	9.9
2.0%	4.2	7.3	8.5	8.0	2.0	11.1
5.0%	3.9	8.1	7.7	7.2	2.1	9.5

Nano polysiloxane acts as a coupling agent by forming chemical bonding with functional groups of jute fibre as well as forms a thin film on the surface of the jute fibre. Nano polysiloxane improves the tensile strength of jute fabric reinforcement up to <0.1% concentration, subsequently reduces the property due to plasticizing effect on jute polymer.

Table FQ3029.2: Mechanical properties of biocomposite from nano polysiloxane treated jute fabric: Unsaturated polyester resin

NPS conc (%) owf	*Tensile Strength (MPa)*	*Tensile modulus (GPa)*	*Flexural strength (MPa)*	*Flexural Modulus (GPa)*	*ILSS (MPa)*
Control	38.9	3.8	66.0	3.0	4.1
0.05	38.8	5.0	93.6	6.5	7.6
0.10	42.5	5.7	110.0	8.7	8.5
0.50	37.3	5.0	77.4	4.1	7.4
1.0	35.0	4.2	55.9	3.3	7.0
2.0	31.3	3.8	52.0	3.1	6.9
5.0	31.2	3.4	51.6	2.9	6.4

0.1% nano polysiloxane treated jute fabric based biocomposites have shown 9, 50, 107, 190 & 107% improvement in tensile strength (MPa), tensile modulus(GPa), flexural strength(MPa), flexural modulus (GPa), ILSS (MPa) in comparison to untreated jute based biocomposite. Jute fiber-surface silanization gave better interfacial load transfer efficiency but do not seem to improve the flexural and tensile properties of biocomposites. It is also inferred that diffusion and formation of nano polysiloxane film at lower concentration improves crystalline region, while above 0.1% , nano polysiloxane slightly decreases the crystalline region of the cellulose polymer, which also responsible for the drastic reduction in the mechanical properties of biocomposite, since crystalline region plays a major role in the strength of jute reinforcement. The formation of polymer film on the surface of the fibre also leads to reduce the interfacial adhesion between jute fibre and USP resin. It ultimately led to formation of void and reduced the density of the biocomposite.

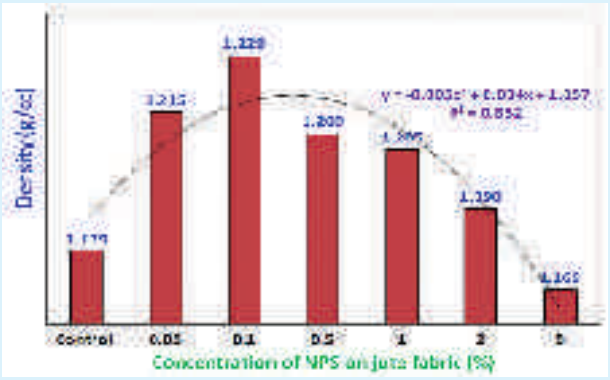


Figure FQ3029.1: Density of jute based biocomposites from NPS modified jute fabric

It is concluded that the application of nano polysiloxane might be restricted to lower concentration (0.10% owf) in order to enhance the interfacial adhesion between jute reinforcement and USP resin, while at >0.10% polysiloxane lead to plasticizing effect rather than coupling effect.

Synthesis of Low Molecular Weight Compatibilizing agents for Modifying the Surface Topography and Functionality of Jute

A chemical compatibilizer is basically a blend of small molecules that reacts with the fibre surface improving the degree of cross- linking in the interface region. These compounds are generally characterized by being of dual or multiple functionality.

Synthesis of low molecular weight chemical compatibilizer

Synthesis of a low molecular weight chemical compound involves the reaction between an acid/acid anhydride and a glycol. A series of chemical compatibilizer have been synthesized in which CA-18 and CA-26 have been identified and selected as suitable coupling agent for jute based biocomposite.

Synthesis of CA-18 & CA-26

The schemes for synthesis of CA-18 & CA-26 are as follows:

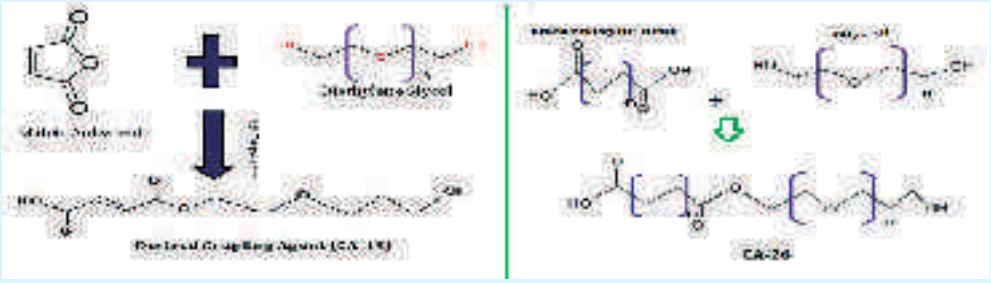


Figure FQ3029.2-Synthesis of CA-18 & CA-21

Synthesis of the above coupling agents have been optimized by the following parameters like ratio between acid & glycol and synthesis temperature. After application of these compatibilizer on jute fabric by conventional exhaustion method, moisture regain of fabric were evaluated in order to assess its efficiency.

Effect of application of compatibilizer

CA-18 composed of maleic anhydride and diethylene glycol in a ratio of 1.1:1 and CA-26 is composed of succinic acid and diethylene glycol in a ratio of 1.1:1. After application of CA- 18 & CA-26 on jute fabrics show a remarkable effect on the moisture regain of the jute fabrics. It is observed that that the least moisture regain properties of the jute fabric is being exhibited by the jute treated with 0.5% of CA-18 and 1% CA-26.

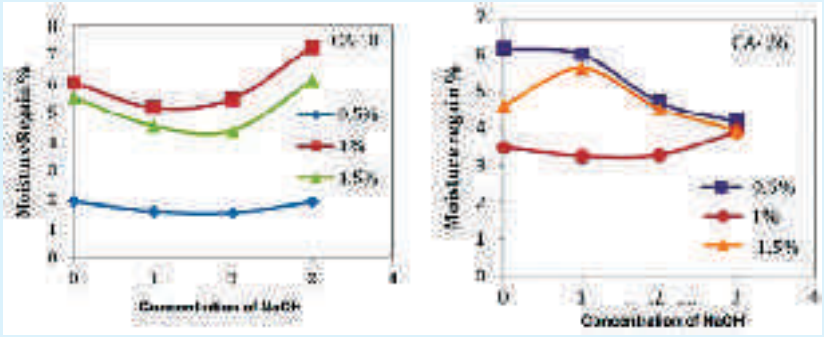


Figure FQ3029.3 : Moisture regain graph of CA 18 treated jute fabric

FTIR Spectra

The FTIR spectrographs of the mother compound and the synthesized compound CA-26, confirms the presence of an ester group in CA- 26.

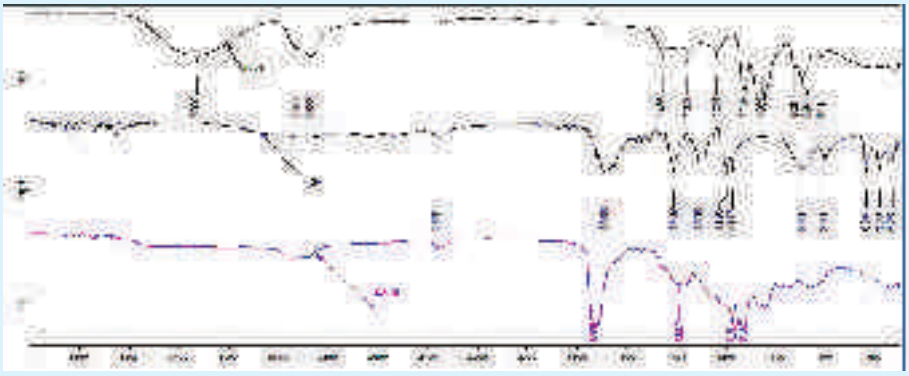


Figure FQ3029.4: FT-IR spectra of comparison between DEG, SA and CA-26

Preparation of Biocomposites

CA 18 treated jute fabrics were used for the preparation of biocomposites by hand laying method and their mechanical properties were evaluated as per ASTM standards. A remarkable increase in mechanical properties with nearly 57.5% increase in Tensile Strength, 49.25% in Flexural strength and most importantly its fibre content by 55 %. This ensures a better fibre matrix interfacial bonding. Out of all the data it is also observed that the optimum condition for the treatment is when the CA is taken at a ratio of 0.5 % on the basis of weight on Fabric.

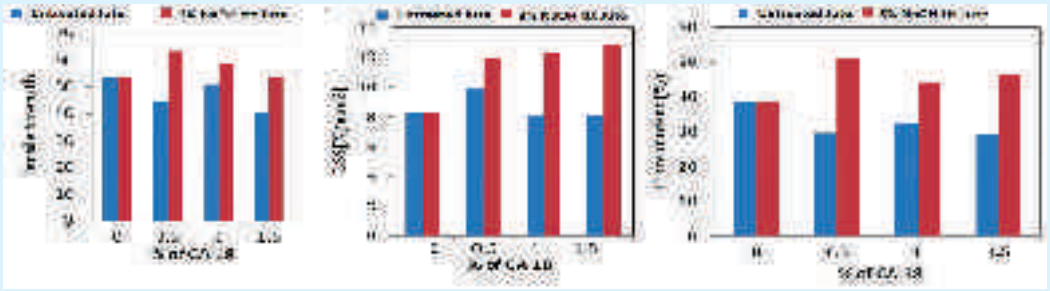


Figure FQ3029.5: Mechanical property of CA-18 treated jute based biocomposites

Similarly CA 26 treated jute based biocomposites were prepared and evaluated. Results inferred that composites prepared from CA- 26 treated jute fabric showed a remarkable increase of 25% Tensile strength, 47% initial modulus, 12% Flexural strength and most importantly 30% increase in the fibre content. The best property is obtained when jute fabric treated with 1% of CA-26.

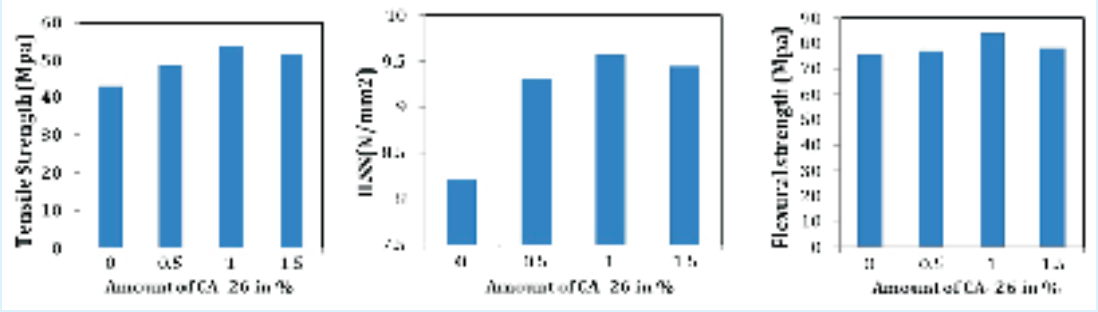


Figure FQ3029.6: Mechanical property of CA-26 treated jute based biocomposites

Biological degradation study of biocomposites

Selective biocomposite samples (0%, 0.5%, 1%, 1.5% of CA-18 treated Jute based biocomposites) were buried into 6-12 inches deep soil as per standard. Buried samples were taken out after a period of 15, 30, 45, 60 days respectively and were tested for their change in mechanical property. It is observed from the table that the controlled samples (0% CA-18) degraded gradually, whereas the CA-18 treated samples were quiet stable in terms of degradation.

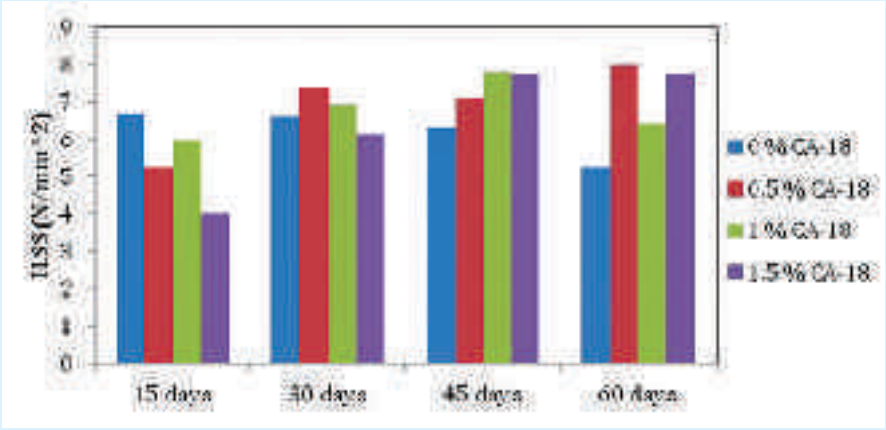


Figure FQ3029.7: ILSS of CA 18 treated biocomposites after different soil burial period

Resin modification

High viscous unsaturated polyester resin (USP) and low viscous USP resin were mixed in ten different proportions (100:0, 95:5, 90:10, 85:15, 80:20, 75:25, 65:35 50:50, 35:65, & 0:100) in order to improve the flow of the resin as well as cover the reinforcement efficiently. Modified resin combinations were used for the preparation of biocomposites (30) by hand laying cum compression moulding method. It is inferred that viscosity of modified resin is decreased as the ratio of low viscous UPS increased.

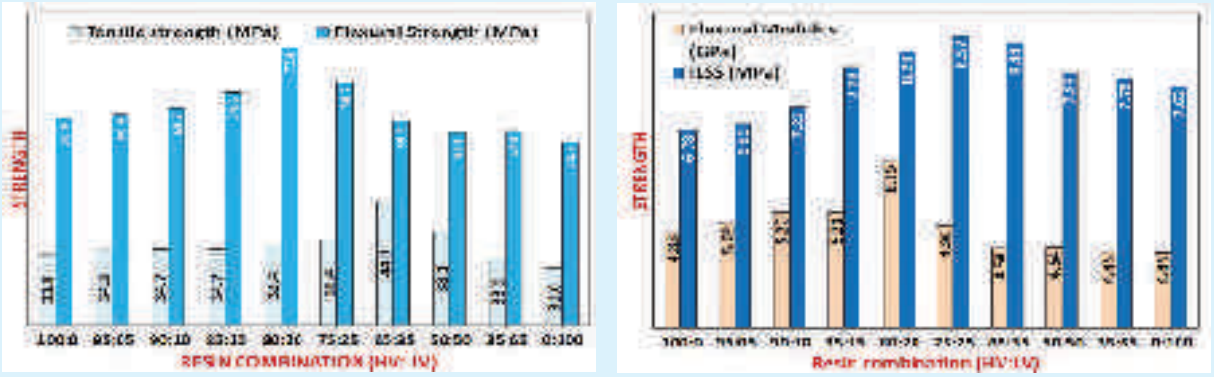


Figure FQ3029.8: Mechanical property of biocomposite prepared from modified resin: Jute fabric

Density of the biocomposites is increased with increasing in proportion of high viscous UPS up to 65% and stabilized, while void content is decreased with increase in low viscous USP resin due to improved spreading of the resin mix in the reinforcement.

Tensile strength of the biocomposite is increased with increasing in the proportion of low viscous resin up to 65:35 proportions and then reduced gradually, while in case flexural strength is increased up to 80:20 proportion and then gradually decreased. It might be due to the low molecular weight polyester resin may be less rigid than high viscous resin, and so flexural strength / flexural modulus did not show improvement in strength after 80:20 proportion. In case of ILSS, since the low viscous resin flow very quickly on the surface of the jute reinforcement , there will be increase in the inter laminar shear strength up to 65:35 combination, and after that there will no significant increase in the ILSS property of biocomposite. It is concluded that 80:20 modified resin combinations gave better flexural properties, while 65:35 combinations gave higher tensile property than other resin combinations.

Development of jute reinforcing fabric with low twist

TD-4 grade based jute yarn with 346 tex and 157.5 twist per meter having 'Z' direction of twist was prepared in conventional spinning system. These yarns were woven into fabric in a handloom with the fabric weight between 290 to 450 g/m2 in 2/2 twill weave. Fabric samples were tested for their tensile properties with the gauge length and crosshead speed are at 0.5 mm and 0.5 mm/min respectively in the standard atmospheric condition maintained at 65%±2% RH and 20°±2°C .

Table FQ3029.3–Influence of warp and weft yarn densities in basic fabric properties

Sample code	*Yarn density in warp and weft*		*Fabric weight and thickness*	
	Ends/dm	*Picks/dm*	*Fabric area density, g/m²*	*Thickness, mm*
HT-1	44	42	319	1.56
HT-2	46	48	339	1.44
HT-3	71	52	447	2.03
HT-4	48	46	291	1.53

From the Table FQ3029.3, it is observed that with the change in warp and weft yarn density, the fabric area density as well as the thickness increases. Table FQ3029.4 presents the correlation between four parameters like GSM, EPI, PPI & thickness. The ends have high correlation with thickness followed by fabric GSM. However poor correlation observed between picks density and fabric thickness.

Table FQ3029.4–Correlation matrix of fabric properties

	GSM	*Ends*	*Picks*	*Thickness*
GSM	1	0.933	0.763	0.905
Ends		1	0.813	0.965
Picks			1	0.631
Thickness				1

The correlation between the fabric parameters and the tensile properties are presented in the Table FQ3029.5.

Table Figure FQ3029.5. Correlation matrix for warp and weft direction of the fabric samples

	Properties	GSM	strain	Tenacity	Energy	Initial Modulus
Warp direction	GSM	1	0.98	-0.85	0.98	-0.18
	strain		1	-0.77	1.00	-0.11
	Tenacity			1	-0.74	0.62
	Energy				1	-0.07
	Initial Modulus					1
Weft direction	Properties	GSM	strain	Tenacity	Energy	Initial Modulus
	GSM	1	0.99	-0.98	0.96	-0.75
	strain		1	-0.99	0.91	-0.75
	Tenacity			1	-0.90	0.84
	Energy				1	-0.62
	Initial Modulus					1

Fabric GSM vs. breaking strain shows maximum correlation coefficient followed by gsm vs tenacity and GSM vs. energy to break of the fabric samples in case of wrap direction of the fabrics. In case of weft direction, fabric strain vs. GSM is maximum correlation coefficient followed by GSM vs. tenacity and GSM vs. energy is concerned. Both warp and weft directions almost similar trend as far as the tensile properties are concerned.

Environmental stability of jute based biocomposites

Soil burial test

Different biocomposite samples were dried at 105°C / 1 hour/ desiccated / weighed and buried in a soil bed for 30 days as per ISO 11721-1:2001 standard. After 30 days, samples were taken out washed with distilled water followed by ethanol and dried at 105°C / 1 hour/ desiccated and weighed. Weight loss (%) and density (g/cc) were measured. Results inferred that jute based biocomposite lost its weight due to attack of anaerobic micro-organism on jute fibre. There is reduction in flexural strength / flexural modulus of biocomposite after soil burial and reduction is higher in twill jute based biocomposite than plain jute fabric based biocomposite due to high fibre content. Resistance of biocomposites against anaerobic micro-organism is better in chemically modified jute fabric based composites than untreated. The resistance is in the order Nano Ag > Nano polysiloxane > H_2O_2 > NaOH> Dry heat treated jute reinforcement.

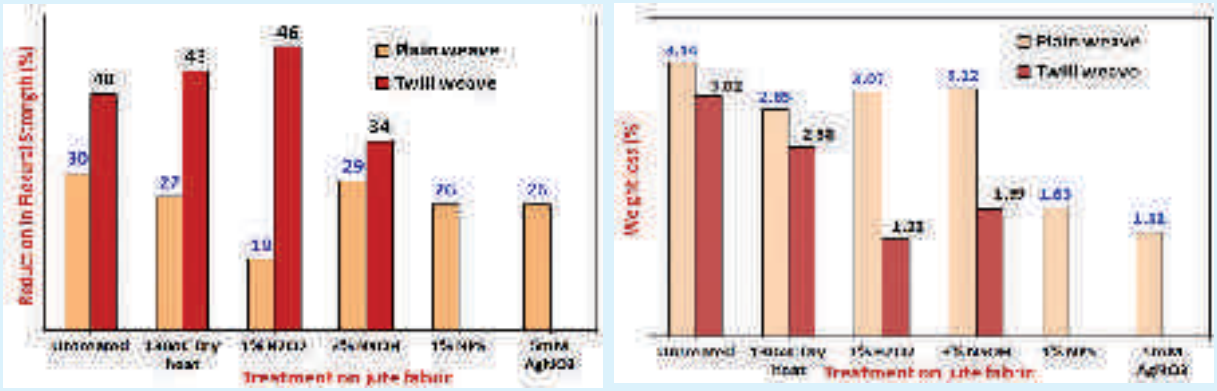


Figure FQ3029.9: Properties of biocomposites before and after soil burial test

Accelerated ageing

Selective biocomposite samples exposed to hot air in an oven at 105°C for 7 days, followed by conditioning & testing their mechanical property. Results inferred that accelerated ageing has detrimental effect on flexural and ILSS properties of jute based biocomposites. Flexural modulus of biocomposite is increased after accelerated ageing and it might be due to increase in stiffness of resin which reduces the elongation of the biocomposite. Chemical modification on jute reinforcement did not have influence on resistance against thermal aging of biocomposites; however fibre content (%) influences the ageing effect.

Anti-microbial activity

Antibacterial and antifungal properties as per AATCC 100 (Zone of inhibition) against S.Aureus, E.Coli & A.Niger were evaluated. Results inferred that nano silver modified jute based composite shown good antimicrobial activity. Bio-safety of the biocomposite samples as per invitro cyto-toxicity was also evaluated. Nano Ag (2.50 mM $AgNO_3$) modified jute based biocomposite did not affect the bio-safety.

Water absorbency test

Biocomposite samples were immersed in water for seven days and add-on weight due to water absorption was studied. Untreated jute based biocomposites absorbs more moisture (>10%) than chemically modified jute based biocomposites (<8%). Plain weave based jute fabric reinforcement have better resistance to moisture absorbency than twill weave in the biocomposite. Bleached jute fabrics (1%) have better resistance in absorption of moisture (2.2%) than other treatments (Figure FQ3029.10).

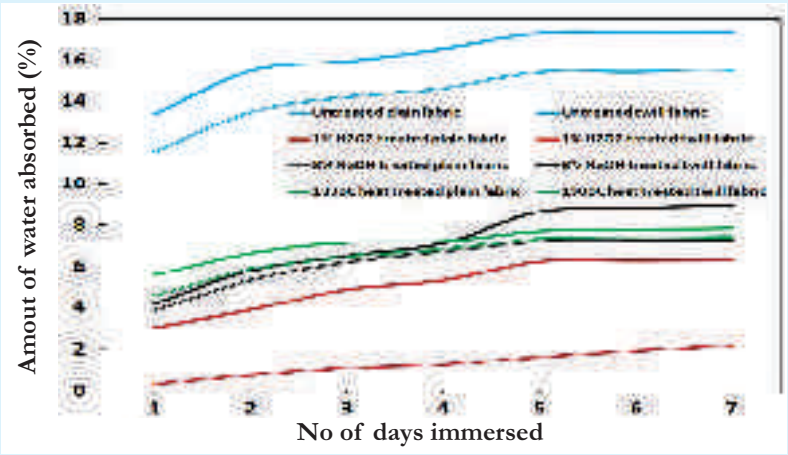


Figure FQ3029.10: Water absorbency of biocomposites

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

Dr. P. Satya & Dr. D. P. Ray*
***ICAR-CRIJAF, Barrackpore**

Ramie *(Boehmeria nivea (L.) Gaud.)*, yields one of the finest fibre since ancient times. It possesses highest strength, good durability, excellent lustre and microbe resistance property. The major hindrance of utilizing this fibre is the presence of complex gummy substance around the fibre bundle and therefore, degumming is a major challenge in industrial level. In this project a systematic approaches has been adopted to find suitable degumming material. This year our target was to validate the non-conventional methods to reduce gum content of fibres by microbial means.

Validation of non-conventional chemical degumming method of ramie fibre

The extreme degumming approaches diluted to achieve finer quality ramie fibre as it loses its strength. Therefore, along with the conventional sodium hydroxide, a couple of non-conventional degumming technologies were adopted in our laboratory. The approaches are enumerated hereunder:

- Decorticated ramie fibre was boiled with hot 8 % sodium hydroxide solution, neutralized with acetic acid, washed with distilled water and air dried.
- Decorticated ramie fibre was boiled with 8 % sodium hydroxide + polyvinyl alcohol + sodium chloride, neutralized with acetic acid, washed with distilled water and air dried.
- Decorticated ramie fibre was treated with 8 % sodium hydroxide + sodium chloride in a boiling water bath, neutralized with acetic acid, washed with distilled water and air dried.
- Ramie fibre was degummed with 1%, 2% and 3% of sodium hydroxide respectively, under high pressure, neutralized with acetic acid, washed with distilled water and air dried.
- Ramie fibre was degummed with sodium hydroxide, sodium sulphide and sodium carbonate in a specific ratio and under pressure; neutralized with acetic acid, washed with distilled water and air dried.

The physical properties of the air dried degummed samples were evaluated and it is revealed from the experiment that as the concentration of alkali increases the tenacity of the fibre falls drastically.

Table FQ-3030.1: Bundle tenacity and fineness of non-conventionally degummed ramie fibres

Sample	Bundle tenacity (g/tex)	Fineness (tex)
8% sodium hydroxide treatment only	18.10	0.87
8% sodium hydroxide and sodium chloride treatment	20.20	0.60
8% sodium hydroxide, polyvinyl alcohol and sodium chloride treatment	21.80	0.78
1% sodium hydroxide treatment at high pressure	24.50	0.70
2% sodium hydroxide treatment at high pressure	23.40	0.80
3% sodium hydroxide treatment at high pressure	22.30	0.76
Sodium hydroxide, sodium sulfide and sodium carbonate, under pressure	21.10	0.86

The result shows that when the fibre is treated with 8% sodium hydroxide alone, the bundle tenacity of the fibre severely reduced. Such a high percent of strong alkali damages the fibre and adversely affects fibre quality. 1% of sodium hydroxide under high pressure successfully removes the gum without affecting the bundle strength and fineness of the fibre. Thus among all non-conventional chemical degumming technologies practised in our laboratory, 1% sodium hydroxide treatment at high pressure is found to be the best. Instead of heating for one or two hours in boiling water bath, if the fibres were treated only with sodium hydroxide (1, 2 or 3%) at high pressure, the bundle strength and fineness of the fibres did not deteriorate much.

Microbial degumming of ramie fibres

Microbial degumming is an alternative, eco-friendly and less expensive method of degumming. Degumming of fibre by microbial action was found suitable and experimental set-up was made accordingly. For the purpose, bacteria was isolated and purified from local from soil by serial dilution-agar plating method and the pure cultures were obtained. Degumming of ramie fibres was done using this pure culture at different days interval. The pure cultures were preserved for further studies, like strain identification, microbial enzyme isolation etc.

Bacteria, isolated from soil, were cultured in a nutrient broth. Generally 72 hours old culture was used for degumming. Degumming of ramie fibres were carried out in 500ml Erlenmeyer flask using 10g decorticated dried ramie fibre and 300 ml crude culture. Flasks were shaken at 120 rpm at room temperature for 5, 10, 15, 20 and 30 days. Fresh cultures were added at every 3 days interval. It was found that optimum degumming was observed on 15th day. Residual gum content was determined by sodium hydroxide method.

Table FQ-3030.2: Residual gum content of ramie fibre after microbial degumming

Sample	Gum content
Raw fibre	21.99 %
5 days	20.48 %
10 days	18.98 %
15 days	12.14 %
20 days	8.03 %
30 days	6.88 %

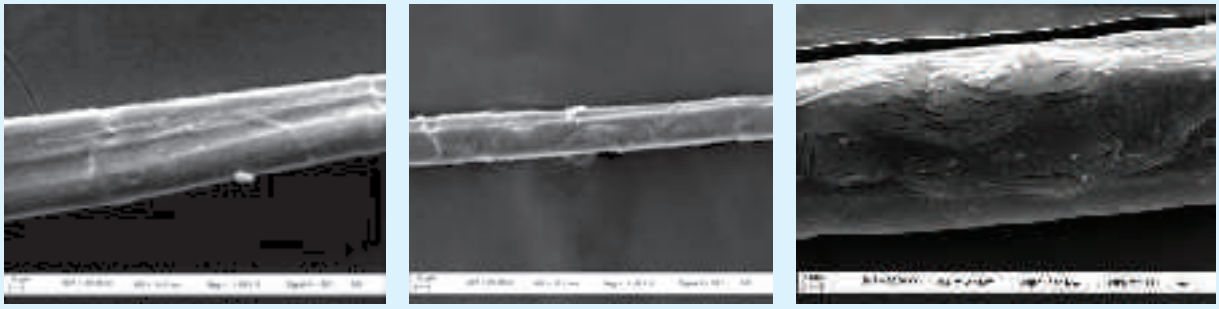
Figure FQ-3030.1: Agar slant containing pure culture

Figure FQ-3030.2: Ramie fibre immersed in 72 hours culture of bacteria.

Figure FQ-3030.3: Agar plating of soil bacteria isolated from soil.

Study of fibre morphology of degummed fibre

Fibre morphology was studied by Scanning Electron Microscope (SEM). Figure FQ3030.4 shows that ramie fibre degummed with 1% sodium hydroxide has no deformations on surface of the fibre. Most of the gum is removed and a smooth surface is observed. From Figure FQ3030.2, it is observed that 0.5% sodium hydroxide treated ramie fibre shows partial gum removal with more or less smooth morphological features. Raw decorticated ramie fibre with rough morphology due to the presence of gummy materials is observed in Figure FQ3030.4.



SEM Micrograph of degummed ramie fibre (1% NaOH)

SEM Micrograph of Degummed ramie (0.50% NaOH) fibre

SEM Micrograph of Decorticated fibre

Figure FQ-3030.4: Surface of morphology of fibre as observed under SEM

Fourier Transformation Infrared Spectroscopy (FT-IR) analysis of raw and degummed fibre

Infrared spectroscopy is the study of the interaction of infrared light with matter. The fundamental measurement obtained in infrared spectroscopy is an infrared spectrum, which is a plot of measured infrared intensity versus wavelength (or frequency) of light. FT-IR analysis of raw and degummed ramie fibre was carefully compared. It was observed that in degummed fibre the number of peaks in the region of 1625 cm^{-1} to 1200 cm^{-1} had greatly reduced in degummed fibre due to the removal of hemicelluloses by strong alkali.

Findings

- Along with the conventional sodium hydroxide treatment some non-conventional chemical degumming methods have been validated for degumming of ramie fibre
- A microbial (bacterial) culture have isolated from the local soil and purified for degumming of Ramie. The culture found to be effective enough to remove gum within a period of ten days.
- The surface morphology of the degummed fibre extracted from the microbial and chemical degumming has been studied properly during the period of reporting.
- A Fourier Transformation Infrared Spectroscopy (FT-IR) based method of degumming is being validated for easy reporting of degumming of ramie fibre.

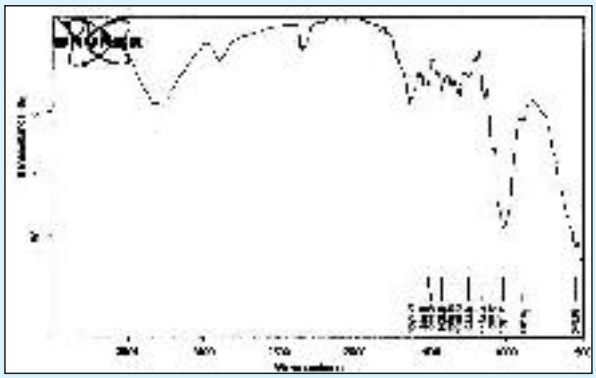


Figure FQ-3030.5: FT-IR of raw ramie fibre

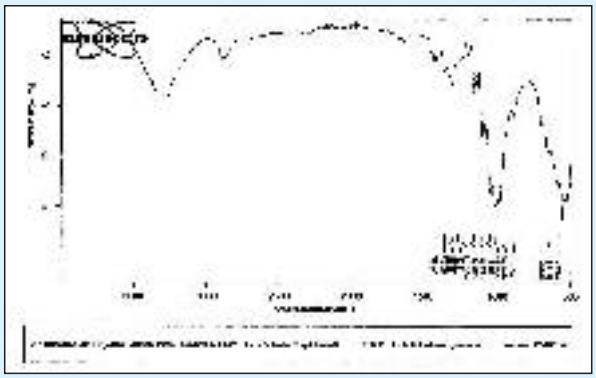


Figure FQ-3030.6: FT-IR of degummed ramie fibre

AINP 1.01 Activity:Quality evaluation of jute and allied fibres under various agricultural trials

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

Jute, Mesta, Flax & Sunnhemp fibre samples grown under different agronomical conditions at different participating research centres were received under this network project. Total numbers of samples tested in the year 2014-15 were 500. Out of which 260 samples were received in 2013-14 and 240 samples were received in 2014-15 respectively. Strength, fineness values and grading of jute, kenaf, roselle and sunnhemp fibre samples were carried out.

Table AINP 1: Samples tested in the year 2014-15

Entries	No of samples tested in 2013-14	No. of samples tested in 2014-15
Capsularis jute	50	80
Olitorius jute	33	66
Roselle (Bimli)	62	19
Kenaf	65	12
Sunnhemp	44	63
Flax	06	-
Total	**260**	**240**

Dr. S. C. Saha, Senior Scientist, NIRJAFT, presented the results of fibre quality trials of fibre samples obtained from various AINP centres in the 28th Annual Workshop of AINP 2014-15 held at CRIJAF, Barrackpore on 13th & 14th February, 2015. The session was chaired by Dr. N. Gopalakrishnan, ADG (CC), ICAR and Co-chaired by Dr. D. Nag, Director, NIRJAFT.

Patent

Patent Granted

Dr. S. K. Bhattacharya, Dr. G. Roy, Dr. A. K. Sinha, Dr. M. Naskar & Dr. S. N. Ghosh, A patent (Application no. 620/KOL/2006) on ***Thermal Insulation value tester for jute products*** has been granted bearing number 262113.

Patent filed

1. Dr Anindita Sengupta, Mr Subhasis Roy, IIEST, Shibpur and Dr Surajit Sengupta, NIRJAFT, Principal Scientist, Kolkata has filed a patent on ***A yarn characterisation unit***, file no. 897/KOL/2014 dated Aug 29, 2014.

2. Dr. Surajit Sengupta, Dr. Sanjoy Debnath of NIRJAFT, Kolkata and Dr Anindita Sengupta of IIEST, Shibpur has filed a patent on ***A system for testing dynamically bending behaviour of semi-rigid fabrics and a method of such testing,*** file no. 1118/KOL/2014 dated Nov 01, 2014.

3. Dr. Surajit Sengupta and Dr. Sanjoy Debnath has filed a patent on ***A system for measuring electrical behaviour of textile material***, file no.1188/KOL/2014 dated Nov 17, 2014.

RESULT-FRAME WORK DOCUMENT FOR ICAR-NATIONAL INSTITUTE OF RESEARCH ON JUTE & ALLIED FIBRE TECHNOLOGY KOLKATA (2013-14)

SECTION 1:

Vision, Mission, Objectives and Functions

Vision:

To uphold the cause of jute and allied fibres in favour of farmers, trade and industry keeping in view the prevalent global scenario and bring back the glory of the golden fibre with socio-economic uplift.

Mission:

To utilize jute and allied fibres in wide and diverse areas by exploiting the intrinsic and advantageous properties of the fibres and converting the demerits whatsoever into merits by application of scientific tools through development of technologies, products and processes for the benefit of farmers and industries of both large and small scales.

Objectives:

1. Technological support for quality improvement and assurance of jute, mesta and other allied fibres.
2. Development of technologies for diversified uses of plant fibres, by-products & industrial wastes, transfer of technology and capacity building.

Functions:

- Working on jute as well as allied fibres and their agro and industrial residues
- Post harvest aspects and development of products out of jute as well as from allied fibres
- Research and development (R & D) activities on both woven and non-woven products to be used as domestic goods, disposable bags, floor coverings, geo-textiles, agro-textiles, other technical textiles and composites
- To deal with the problems of both large and small scale industries, organized and decentralized sectors and the farming community
- To function in close collaboration with industries and entrepreneurs on one hand and academic institutions on the other

SECTION 2:

Inter se Priorities among key Objectives, Success Indicators and Targets

Objectives	Weight %	Actions	Success Indicators	Unit	Weight %	Target/criteria value				
						Excellent	Very good	Good	Fair	Poor
						100%	90%	80%	70%	60%
Technological support for quality improvement and assurance of jute, mesta and other allied fibres.	35	Technology support to jute breeders, industries & Jute Export houses	Breeder and Commercial samples (fibre, yarn, fabric etc.) tested for quality evaluation	Number	30	342	308	278	240	205
		To fabricate grading aid instruments for farmers, industries and stake holders	Equipment fabricated	Number	5	6	5	4	3	2
Development of technologies for diversified uses of plant fibres, by-products & industrial wastes, transfer of technology and capacity building	54	Development of new product/ machinery / instrument / technology	New product/ machine/instrument/ technology / Technology up-gradation	Number	39	5	4	3	2	1
		Entrepreneurship Development and Training	Programmes organised	Number	15	13	12	11	9	8
Efficient Functioning of the RFD System	3	Timely submission of Draft RFD (2013-14) for approval	On-time submission	Date	2.00	15/05/ 2013	16/05/ 2013	17/05 /2013	20/05/ 2013	21/05 /2013
		Timely submission of Results for RFD (2012-13)	On-time submission	Date	1.00	01/05/ 2013	02/05/ 2013	05/05 /2013	06/05/ 2013	07/05 / 2013
Administrative Reforms	4	Implement ISO 9001 as per the approved action plan. Prepare an action plan for Innovation	% Implementation	%	2.00	100	95	90	85	80
			On time submission	Date	2.00	30/07/ 2013	10/08/ 2013	20/08/ 2013	30/08/ 2013	10/09/ 2013
Improving Internal Efficiency /responsiveness / service delivery of Ministry / Department	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2.00	100	95	90	85	80
			Independent Audit of implementation of public grievance redressal system	%	2.00	100	95	90	85	80

SECTION 3:
Trend Values of the success indicators

Objectives	Weight %	Actions	Success Indicators	Weight %	Unit	Actual Value for FY11/12	Actual Value for FY12/13	Target Value for	Projected Value for	Projected Value for
Technological support for quality improvement and assurance of jute, mesta and other allied fibres.	35	Technology support to jute breeders, industries & Jute Export houses	Breeder and Commercial samples (fibre, yarn, fabric etc.) tested for quality evaluation	30	Number	282	295	**FY13/14** 308	**FY14/15** 320	**FY15/16** 327
		To fabricate grading aid instruments for farmers, industries and stake holders	Equipment fabricated	5	Number	4	4	5	5	6
Development of technologies for diversified uses of plant fibres, by -products & industrial wastes, transfer of technology and capacity building	54	Development of new product/ technology /process/ instrument /machinery	New product/ machine/instrument/ technology / Technology up-gradation	39	Number	3	3	4	5	6
		Entrepreneurship Development and Training	Programme organised	15	Number	10	11	12	13	15
Efficient Functioning of the RFD System	3	Timely submission of Draft RFD (2014-15) for approval	On-time submission	2	Date			16/05/ 2013		
		Timely submission of Results for RFD (2012-13)	On-time submission	1	Date			02/05/ 2013		
Administrative Reforms	4	Implement ISO 9001 as per the approved action plan.	% Implementation	2	%			95		
Improving Internal Efficiency / responsiveness/service delivery of Ministry / Department	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	2	%			95		
			Independent Audit of implementation of public grievance redressal system	2	%			95		

SECTION 4:
Acronyms

S.No	Acronym	Description
1.	R & D	Research and development
2.	RFD	Results-Framework Document
3.	NIRJAFT	National Institute of Research on Jute & Allied Fibre Technology
4.	EDP	Entrepreneurship Development Programme
5.	CRIJAF	Central Research Institute for Jute and Allied Fibres
6.	JCI	Jute Corporation of India
7.	NABARD	National Bank for Agriculture and Rural Development
8.	NGO	Non Government Organization

Description and Definition of Success Indicators and Proposed Measurement Methodology

Sl.No.	Success indicator	Description	Definition	Measurement	General Comments
1	Breeder and Commercial samples (fibre, yarn, fabric etc.) tested for quality evaluation	Quality evaluation of jute and allied fibres under various agricultural trials under "All India Network Research Project on Jute & Allied Fibres" finally aims to select varieties and treatments which produce fibres of good quality and also have good yield for variety release and treatment recommendation to the farmers. Commercial samples received from industries and export houses are also tested.	Evaluation of physical and chemical parameters of fibre, yarn, fabric, composites, paper etc. for quality assessment	Number of samples	All the tests/evaluations are done as per the requirement of stakeholders following standard methods.
2	Equipment fabricated	Jute grading instruments viz. Strength tester, fineness tester, colour and lustre meter, bulk density tester, yarn hairiness counter, thermal insulation tester etc. developed by NIRJAFT are fabricated against supply order.	Instruments for determination of strength, fineness, colour, bulk density, hairiness, thermal insulation value etc. of fibre and fibrous structures (yarns, fabrics etc.).	Number of Equipments/ Instruments fabricated	Instruments developed at NIRJAFT are fabricated and supplied against order.
3	New product/ machine/instrument/ technology / Technology up-gradation	Technology/process development for new products from jute/allied fibres and their blends with fibres of natural and man-made origin using cutting edge technologies e.g., nano and bio technology, compact spinning etc. Designing of suitable textile structures for biocomposite geo/agro textile applications; machinery and instrument development for better process control.	To diversify application of jute and allied fibres in value added applications and improvement of existing product range in terms of quality and production efficiency; upgradation of machineries and instrumentations for process control leading to superior products at higher efficiency.	Number of technologies	To utilize jute and allied fibres in wide and diverse areas by exploiting the intrinsic and advantageous properties of the fibres and converting the demerits whatsoever into merits by application of scientific tools through development of technologies, products and processes for the benefit of farmers, artisans and industries of both large and small scales.
4	Programmes organised	Frontline demonstration, field and industrial trial, training programmes, workshops, talk delivered, seminars, EDP	To commercialize the technologies, entrepreneurship development and to promote public-private partnership; it is envisaged to make awareness through training, demonstration, entrepreneurship development programme	Number of programme organised	These programmes are based on different technologies developed at the institute and are conducted for transferring technologies.

SECTION 5:

Specific Performance Requirements from other Departments

Location Type	State	Organisation Type	Organisation Name	Relevant Success Indicator	What is your requirement from this organisation	Justification for this requirement	Please quantify you r requirement from this Organisation	What happens if your requirement is not met.
Urban	Delhi	Govt.	Department of science and technology	New product/ machine/instrument/ technology / Technology up - gradation	Project sponsorship	Broad basing of our research areas	Two R&D projects	Have to search for alternative sponsors.
Urban	West Bengal	Govt.	Development Commissioner for Handicrafts	Programmes organised	Programme sponsorship and identification of trainees	For identification of proper/appropriate participan ts	Sponsorship of 8 programmes per year	To search for alternate organisations

SECTION 6:

Outcome / Impact of activities of organisation /ministry

Sl. No.	Outcome/impact	Jointly responsible for influence this outcome impact with the following organizations departments/Ministry	Success indicators	Unit	2011-12	2012-13	2013-14	2014-15	2015-16
1	Scientific grading of jute fibre	Ministry of textiles, Jute industry, CRIJAF, JCI	Share of total jute fibre produced which is graded scientifically	%	4	4	4	5	5
2	Alternative products for jute /other industries	Jute industry, National Jute Board Cottage and small scale industry.	Enhancement of production of jute crop based diversified products	%	2	2	2	2.2	2.4
3	Human resource development	Ministry of Te xtiles, NABA RD, NGOs	Skilled manpower developed	Number	100	110	125	140	155

Performance Evaluation Report of RFD 2013-14

S.No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Consolidated Achievements	Performance		Percent achievements against Target values of 90% Col.*	Reasons for short- falls or excessive achievements, if applicable
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%	Poor 60%		Raw Score	Weighted Score		
1	Technological support for quality improvement and assurance of jute, mesta and other allied fibres.	35	Technology support to jute breeders, industries & Jute Export houses	Breeder and Commercial samples (fibre, yarn, fabric etc.) tested for quality evaluation	Number	30	342	308	278	240	205	382	100	30.00	124	Due to arrival of more number of samples during harvesting period excess no. of samples were analysed
			To fabricate grading aid instruments for farmers, industries and stake holders	Equipment fabricated	Number	5	6	5	4	3	2	7	100	5.00	140	Because of the seasonal crops, demand for instrument fluctuates. Higher demand of instruments from the Stake Holders was recorded than what anticipated
2	Development of technologies for diversified uses of plant fibres, by-products & industrial wastes, transfer of technology and capacity building	54	Development of new product/ machinery / instrument / technology	New product/ machine/instrument/ technology / Technology up-gradation	Number	39	5	4	3	2	1	6	100	39.00	150	Due to completion of some Externally Funded Projects including NAIP along with In-house Projects, one additional technology was developed
			Entrepreneurship Development and Training	organised	Number	15	13	12	11	9	8	14	100	15.00	116.7	More training was organized due to extension of NAIP Projects

3	Efficient Functioning of the RFD System	3	Timely submission of Draft RFD (2013-14) for approval	On-time submission	Date	2	15/05/13	16/05/13	17/05/13	20/05/13	21/05/13	13/05/13	100	2.00	100
			Timely submission of Results for RFD (2012-13)	On-time submission	Date	1	01/05/13	02/05/13	05/05/13	06/05/13	07/05/13	30/04/13	100	1.00	100
4	Administrative Reforms	4	Implement ISO 9001 as per the approved action plan.	% Implementation	%	2	100	95	90	85	80	100	100	2.00	100
			Prepare an action plan for Innovation	On time submission	Date	2	30/07/13	10/08/13	20/08/13	30/08/13	10/09/13	30/07/13	100	2.00	100
5	Improving Internal Efficiency /responsiveness /service delivery of Ministry/ Department	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2	100	95	90	85	80	60	0	0	0
				Independent Audit of implementation of public grievance redressal system	%	2	100	95	90	85	80	100	100	2.00	100
												Total Composite Score:			98.00

RESEARCH & DEVELOPMENT PROGRAMME 2014-15

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
	Quality Evaluation & Improvement Division			
QEI-4	*Standardization Of Fungal Retting By Dry Fermentation Procedure For Water Economy*	Dr S Banik	April, 2010	September, 2014
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, 2015
QEI-12	*Development Of An Extractor To Produce Good Quality Banana Fibre For Textile Use*	Dr L K Nayak	April, 2012	March, 2015
QEI-13	*Design And Development Of A Commercial Extractor For PALF*	Dr L K Nayak	October, 2012	March, 2015
QEI-15	*Performance Analysis Of Crop SpecificAgrotextiles*	Dr Biplab Saha	October, 2013	September, 2016
QEI-16	*Development Of Electronic Colour And Lustre Meter For Jute And Mesta Fibre*	Dr G Roy	October, 2013	September, 2015
	Mechanical Processing Division			
MP-8	*Development of PALF-Silk-Ramie Blended Apparels*	Shri Seiko Jose	April, 2013	March, 2016
MP-9	*Development Of Suitable Expert System For Analysis Of Defects Of Jute Fabrics During Inspection*	Shri Sujai Das	May 2012	March, 2015
MP-10	*Development Of Nonwoven Fabrics From Banana And Sunhemp Fibres*	Dr S Sengupta	April 2014	March, 2016
MP-11	*Development Of Portable Coconut Fibre Strength Tester*	Dr G Basu	April 2014	March, 2016
MP-12	*Development Of Coated And Laminated Products Based On Jute*	Dr G Basu	April 2014	March, 2016
MP-13	*Development And Evaluation Of Eco-Friendly Water Soluble Jute Conditioning Agent*	Shri Seiko Jose	April, 2014	March, 2016
	Chemical & Biochemical Processing Division			
CBP-7	*Application Of Enzymes For Making Pulp And Paper With Improved Characteristics Using Different Lignocellulosic Fibre*	Dr S N Chattopadhyay	October, 2012	September, 2015
CBP-8	*Development Of Bioadhesives For The Use Of Agricultural Residues (Cassava Stalk, Coconut Stem) In Preparation Of Particle Board*	Dr N C Pan	October, 2012	March, 2015
CBP-9	*Functional Finishing Of Jute Textile By Suitable Nanoparticles*	Dr L Ammayappan	October, 2012	September, 2015
CBP-10	*Eco-friendly Printing Of Jute With Natural Dyes*	Dr S N Chattopadhyay	April, 2014	March, 2017
CBP-11	*Development Of JutePulp For Making Tissue Paper And Sanitary Napkins*	Dr A K Roy	April, 2014	March, 2017

Project Code	Project Title	Principal Investigator	Date of Start	Date of Completion
		Transfer of Technology Division		
TOT-7	*Studies On Techno-Economic Constraints And Opportunity Of Jute Diversified Products Manufacturing*	Dr S B Roy	October, 2012	September, 2015
TOT-8	*Design, Development And Dissemination Of Jute Based Decorative Fabric*	Dr A N Roy	April, 2014	March, 2017
TOT-9	*Comparative Evaluation Of Ribboner Developed By NIRJAFT*	Dr V B Sambhu	April, 2014	March, 2016
		Sponsored/Contract Research		
NJB/MM-IV/6.2	*Development of electronic and microprocessor based integrated instrumentation for jute grading system*	Dr G Roy	April 2011	March, 2015
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 Dr A Sengupta	April 2012	Sept. 2015
DST-2 IDP/IND/2010/25	*Development Of An Efficient Staple Yarn Characterization Unit With Multi Sensor Fusion And Field Programmable Gate Array (FPGA) Based Data Reduction Card*	Dr A Sengupta BESUS, Howrah Dr S Sengupta NIRJAFT	November, 2011	April, 2015
NFBSFARA-FQ-3029	*Jute Based Biocomposites For Industry*	Dr L Ammayappan	July, 2012	June, 2015
NFBSFARA-FQ3030	*Understanding Genetics And Biosynthesis Of Gum In Ramie (Boehmeria nivea L. Gaud.) For Developing Low-Gum Genotypes*	Dr Pratik Satya ICAR-CRIJAF Dr D P Ray ICAR-NIRJAFT	June, 2012	May, 2016

Institute Activity

International Conference on Natural Fibres (Theme: Jute & Allied Fibres)

Three day International conference on "Natural Fibres (Theme: Jute and Allied Fibres)" was organized by The Indian Natural Fibre Society (TINFS), 12, Regent Park, Kolkata 700 040 in collaboration with National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT), Kolkata; Central Research Institute for Jute & Allied Fibres (CRIJAF), Barrackpore and National Jute Board (NJB), Kolkata on August 1-3, 2014 at Bhasa Bhavan, National Library and The Oberoi Grand, Kolkata. The conference was intended to bring researchers, educationists and industries of India and abroad working in the field of natural fibres specially on jute and allied fibres for mutual exchange of ideas, gathering knowledge of recent developments and future roadmap for researches. Invited foreign delegates from USA, UK, Thiland, Nigeria, South Africa and Bangladesh were participated along with eminent Indians from different states. The Conference was inaugurated by His Excellency Shri Pranab Mukherjee, The President of India, in presence of Shri Keshari Nath Tripathi, Governor of West Bengal; Dr S Ayappan, Director General, Indian Council of Agricultural Research & Secretary, DARE; Shri Firhad Hakim, Minister for Urban Development and Municipal Affairs, Govt. of WB; Dr Subrata Gupta, Jute Commissioner, Govt of India, Shri Raghabendra Gupta, Chairman, Indian Jute Mills Association and Dr Debasis Nag, Chairman, TINFS & Director, NIRJAFT on dais at Bhasa Bhavan, National Library, Kolkata on August 1, 2014.

DG, ICAR welcomed all the delegates and elaborated the importance of research on jute and allied fibres. Shri Hakim stressed upon the issue of mandatory packaging act because 40 lakh families survive directly or indirectly on jute.

In his inaugural lecture, The Hon'ble President of India emphasized the concerted effort by all stakeholders to develop the jute sector. He said that jute agriculture in general and post-harvest technology in particular needs special attention in terms of technology support and extension activities. Improvement in fibre yield, and production of fine fibre with improved strength, colour and luster and devoid of defects that arise on

account of faulty retting will ensure remunerative return to the jute farmers. The judicious development of appropriate process technologies is required to utilize immense potential of many natural fibres allied to jute like Ramie, Coir, Sisal, Banana and Pineapple fibre in manufacturing useful products. He also mentioned the need of use of natural fibres in some areas of technical textiles, including geo-textiles and composites. The inaugural programme has been ended with vote of thanks by Dr Debasis Nag, Chairman, TINFS & Director, NIRJAFT.

The technical discussions were held at the Oberoi Grand, Kolkata on 2nd and 3rd August in two parallel sessions namely Agriculture and Technology. Here, only the fibres and textile related sessions are reported.

Technical session 1 discussed on 'Quality Assessment and Improvement' where Dr D Sur, Ex-Deputy Director, Indian Jute Industries Research Association (IJIRA) and Dr P K Ganguly, Ex-Principal Scientist, NIRJAFT were acted as Chairman and co-Chairman respectively. The session was started with the keynote lecture by Dr R Chattopadhyay, Head, Textile Technology Dept, Indian Institute of Technology, Delhi on 'Natural plant fibres: A SWOT analysis'. The papers were on 'An Automatic Integrated Jute Grading Instrument', 'Some mathematical studies of length of jute fibre via gamma distribution function', 'User-friendly jute Grading System', 'Studies on the variation of fibre quality of ramie grown in two different soil regimes', 'Xylanase production by immobilized cells of Bacillus pumilus', 'Extraction and Characterisation of Banana fibre grown in North East hill areas' and 'Optimisation of Sodium Hydroxide treatment for improved reinforcement of unsaturated polyester resin'.

In presence of Chairman Dr P Majumdar, formar Head, Government College of Engineering &Textile Technology (GCETT), Serampore and co-Chairman Dr S Bhattacharya, In charge, GCETT, Serampore, in the technical session 2 on 'Mechanical Processing & Technical Textiles', the keynote address has been delivered by Dr. R. D. Anandjiwala, Material Science & Manufacturing, CSIR, South Africa. The papers were on 'Studies on the Chemical modification and Spinning properties of jute fibre', 'Processing of banana fibre in jute spinning system and product development', 'Determination of the Yarn Parameters using Image Processing', 'Design and Development of Bituminized Jute Paving Fabric for potential application in the field of Geotechnical Constructions', 'Processing of Himalayan Giant Nettle (Girardinia diversifolia) and its Potential uses in Textile applications', 'Assessment of some physical properties of Dref-III spun yarns by variation of fibre and yarn parameters with Box and Behnken's 3x3 models', 'Energy Efficient Green Sizing Technology for Jute Yarn', 'Design and Development of Computerized Instrument for Testing Bending Behaviour of Semi-rigid Fabrics', 'Tensile properties of jute fabric as reinforcement material for biocomposite', 'Evaluation of agro-textiles in respect of soil and crop parameters in various horticultural production systems of West Bengal'.

The third session on 'Chemical Processing and Composites' was chaired by Dr B C Mitra, Former Director, NIRJAFT and Co-Chaired by Dr D Chakrabarty, Professor, Rajabazar Science College, Calcutta University. The keynote address was delivered by Dr Subhas Chandra Ghosh, Natalie Chipot Eastern Michigan

University, USA on 'Evolution of Smart Textiles for Possible Applications of Lignocellulosic Fibers'. The presentations in this session were on 'Jute based medium density fibre board', 'Production of industrial spirit from Jute fibre: a feasibility study', 'Application of Natural Dyes and Colouration of Textiles as a Biotechnological Processing for Home and Human Envelop', 'Breathable Waterproof Coating for Jute with Compound based on Natural Rubber Latex', 'Bio treatment of jute fibre for making handmade paper following eco friendly pulping',

'Hydrophobic Finishing of Cotton Textile using Atmospheric Pressure Plasma', 'Effect of Chemical Compatabilizers on the properties of jute fibre reinforced unsaturated Polyester Resin Composites', 'Development of particle board from cassava stalk using bioadhesives', Chemical modification of Jute Stick Biomass for Waste-water Treatment', 'Use of coconut fibre for making composites by compression moulding method', 'Study on Jute and lac based bio-composites for industry', 'Chemical Modification of jute fabric with alkaline peroxide and its effect on reinforcement of unsaturated polyester resin', 'Studies on the mechanical, thermal, morphological and barrier properties of nanocomposites based on poly(vinyl alcohol) and nanocellulose from sugarcane bagasse'. In this context, Dr A N Netravali from Cornell University, USA was delivered a special invited lecture on Bio-composite at NIRJAFT on 10.07.14.

In the fourth session, entitled 'Marketing, Diversifications and Related Issues' were discussed under the chairmanship of Dr S Sreenivasan, Former Director, CIRCOT, Mumbai and co chairmanship of Mr N Sengupta, Secretary, NJB. Dr U Mukim of Thailand delivered the 'Case studies for using natural fibre as polymer reinforcement', The other papers were 'Jute Production Information System', 'Intellectual Property Rights in Jute Research', 'Information seeking behaviour of research workers in the field of jute and allied fibre of West Bengal: A case

study', 'Entrepreneurship development through preparation of Jute diversified products and efficient marketing', 'Jute value addition: The way to sustainable growth'.

Dr H S Sen, Former Director, CRIJAF and Dr K K Satapathy, Former Director, NIRJAFT were the Chairman and Co-chairman respectively for the fifth session entitled 'Fibre Extraction'. The papers were on 'Fungal dry retting of jute - a new eco friendly technology of retting', 'Quality jute fibre production in stagnant water with user friendly microbial formulation: Its prospect and impact', 'Chemical retting of coconut fibre aimed at improved textile related properties', 'Development of an extractor for production of good quality banana Fibre', 'Design and Development of NIRJAFT Power Ribboner for Jute & Mesta', 'Relationship between fiber morphology and tensile properties of pig hair fibres'.

Eleven posters were presented on the challenges of jute, chemical retting of jute ribbons, potassium permanganate treated jute for bio-composites, analysis of ramie gum components, extraction of pineapple leaf, thermal characteristics of pig hair fibre, effect of saccharum spontaneum filler on green composite,

dyeing of silk by plasma treatment, ecofriendly biocomposites, R&D of bast fibre, stress analysis of jute composite by finite element method.

According to the judgement of Chairman and co-chainman of different sessions, The best oral presentation was awarded by Dr Kartick Kumar Samanta of CIRCOT, Mumbai for his deliberation on 'Hydrophobic Finishing of Cotton Textile using Atmospheric Pressure Plasma'. Accordingly, 'Effect of pre-treatment of jute fabric with potassium permanganate on the jute polyester based bio-composites' by Ms Debashmita Mondal et al of NIRJAFT was awarded the best poster prize.

The valedictory session was chaired by Mr N Sengupta, Secretary, NJB and cochaired by Dr N Gopalakrishnan, Assistant Director General, ICAR in presence of Dr D Nag, Director, NIRJAFT and President, TINFS, Dr P G Karmokar, Director, CRIJAF and Dr G Bose, Organising Secretary, International Conference on dias. In this Session the recommendations proposed by chairman and co-chairman of different technical sessions were finalised. These recommendations will be the roadway for future researchers and policy makers.

Second C. R. Nodder Memorial Lecture

NIRJAFT celebrated the 2nd C. R. Nodder Memorial Lecture on November 11, 2014 to commemorate the significant achievements of Sir Charles Reynolds Nodder (1894 - 1987) as its first Director (1939-49). On this occasion, Dr. A N Roy, Head TOT Division welcomed eminent textile engineer Dr. V Subramanium, Ex-Professor, Anna University, Chennai & Former Chairman, RAC, ICAR-NIRJAFT and Dr K Alagusundaram, DDG (Engg.), ICAR. In his address, Dr D Nag, Director, NIRJAFT introduced Dr Subramanium & Dr Alagusundaram and highlighted the contribution of Dr Nodder for building up this institute from its infancy and for the progress made in research and development under his supervision. In the presidential address Dr K Alagusundaram, DDG(Engg), delivered a very precise and inspiring speech on responsibilities of scientists in serving the nation through their research work. Dr V Subramanium delivered an informative and thought provoking lecture on "Thermal Conductivity of Fabrics". He very meticulously went through the works carried out so far on thermal conductivity of fabrics and on the development of equipments for measuring this parameter. Dr Subramanium very clearly described the science of thermal conductivity, the need of background knowledge on thermal conductivity and on thermal resistance of different fabrics. He also pointed out the arenas where more research endeavour is needed.

Fourth Dr. P B Sarkar Memorial Lecture

NIRJAFT organized the 4th Dr. P. B. Sarkar Memorial Lecture on January 3, 2015. On this occasion, the key note address was delivered by Prof. (Dr.) Swadesh Sett, Former Principal, Govt. College of Engg & Textile Technology, Serampur & Baharampur, West Bengal. Prof. Sett delivered on characteristics of different fibres, their advantages and disadvantages. He addressed the natural fibres like cotton, jute, silk, wool etc. as well as the modern high tenacity, high modulus synthetic fibres. The manufacturing processes of all these fibres and their use in making different products etc. were described in detail. During discussion Dr D Sur highlighted that biodegradable synthetic fibres is the future threat of natural fibres, therefore we have to take action to save the natural fibres.

Institute Industry Interface Workshop

An Institute Industry Interface Workshop was held on February 12, 2015 at NIRJAFT to present and promote three testing equipments namely 'Fabric Flexural Rigidity Tester', 'Yarn Characterisation Unit' and 'Fabric Electrical Insulation Tester' which are designed and developed by the joint effort of NIRJAFT, Kolkata and Indian Institute of Engineering Science and Technology (IIEST), Shibpur, Howrah. First two are developed in collaboration with M/s Tech (Style) India, Howrah and in assistance with

Department of Science and Technology (DST), Ministry of Science and Technology, Govt. of India. The workshop was inaugurated by Chief Guest Prof. Ajoy Ray, Founder Director, IIEST, Shibpur & former Vice-Chancellor, Bengal Engineering and Science University, Howrah in presence of Guest-of-Honour Dr Subrata Gupta, Jute Commissioner and Chairman-cum Managing Director, JCI, Govt of India.; Dr. Debasis Nag, Director, NIRJAFT Dr B C Mitra, Ex-Director, NIRJAFT, Kolkata and dignitaries from academic institutes and industries. In the welcome address, Dr D. Nag has elaborated the importance and role of Institute Industry Interface Workshop and mentioned that the concept has been coined by Indian Council of Agricultural Research, as well as DST, Govt of India with the idea as the first step of commercialisation, any fruitful research or development will be showcased to beneficiaries or stakeholders to rectify the technologies as per the suggestions of experts and stakeholders. Dr S Gupta, The Guest of Honour, emphasized to develop the technologies according to users' want and it should be simple to operate, low manufacturing as well as maintenance cost, compact and cost effective. Moreover, measurement and standardisation of testing equipment should be précised and

sometimes it should be portable to measure online or in the field. He congratulated the developers of present equipments and wished the successful commercialisation. Dr A Ray, the Chief Guest, encouraged the joint effort in characterisation of yarn and fabric. He suggested to extend the work and requested to use the natural materials. He pointed out the commendable jobs of the researchers which has not been reached to the people. He also requested to go to media if they do not come to us of their own. Ninety five delegates from 28 different organizations were present in the occasion. Above mentioned three equipments were presented, discussed and demonstrated to the beneficiaries and stakeholders. Delegates from academic institute, research organizations and industries showed very much interest on those instruments, interacted enthusiastically with principal investigators and suggested the necessary modifications needed for successful commercialization.

Another Institute-Industry Interface Workshop was held on March 13, 2015 to demonstrate the 'Automatic Integrated Jute Grading System' which is the outcome of a project under the assistance of National Jute Board, Ministry of Textiles, Govt. of India. The workshop was inaugurated by Chief Guest Dr Subrata Gupta, The Jute Commissioner, Govt. of India. Dr D Nag, Director, NIRJAFT welcomed the Jute

Commissioner, the Chairman-cum-Managing Director(CMD) of Jute Corporation of India (JCI), other dignitaries from Industries, JCI, Jute balers, IJMA, Farmers, teaching and research institutes. He told that by this instrument all the jute grading related parameters can be tested in a single passage of fibres. He expected that it will solve the ambiguity in jute grading system helping both the farmers and industry and invited the suggestions to improve it further. The Guest of Honour, Mr A K Chakravorty, CMD, JCI complimented the scientists involved in its development and opined that success of this development depends on its performance in the farmers field. He also stated that this instrument can eliminate the long sustained confusion of farmers regarding nonavailability of real price of their produce. The Jute Commissioner in his deliberation pointed out that the grading parameters should be well defined and measured automatically so that the variation due to human intervention can be eliminated. He opined that classification of jute by industry and farmers at present is not unified and convincing, therefore standardization is required. He also suggested different stakeholders for constructive criticism to get perfect instrument. He requested the stakeholders to send known samples for grading and this way we can check the effectiveness of the system. Then the instrument was demonstrated elaborately by Dr G Roy, Principal Scientist and PI of that project. After the deliberation and demonstration, a lot of discussion was held of dignitaries with different sectors. They have shown a great interest and hope for its success.

Brain-storming lecture

The Innovation Cell headed by Director, NIRJAFT organised a brain storming session on 'Sustainability of Indian Jute Industry in the face of gradual relaxation of Jute Packaging Materials Act (JPMA)' at NIRJAFT on Sept 20, 2014. In this occasion, the speaker was Mr S K Chandra, Chief Executive (Works) & Director, Hooghly Infrastructure Pvt. Ltd and Chairman, Technical Development Division, IJMA. He has highlighted

the pros and cones of the jute industry in this crisis of relaxation of JPMA and pointed out that relaxation of JPM act will have very big impact on the socio-economic and environmental value of this sector. Usage of jute fibre will not only help in protecting our environment but also helps our country to fulfil its commitments to the International community. He predicted that relaxation/dilution/fading away of JPM act is equivalent to pronounce death sentence to the Jute Industry. Scientists of NIRJAFT actively participated in the discussion.

The next brain storming lecture has been organised by the Innovative Cell of NIRJAFT on March 4, 2015 under the Chairmanship of Dr D Nag, Director, NIRJAFT. The Chief Guest and Invited Speaker was Mr D C Baheti, Managing Director, Gloster Industries Ltd; Executive Member, Jute Export Council; Member, Executive Committee, National Jute Board, Govt of India and Ex-Chairman, Indian Jute Industries Research Association. In the warm welcome address, Dr Nag has expressed happiness and gratitude for the presence of Mr Baheti who is the most progressive, pragmatic and torch-bearer of jute industries and he wanted to know from Mr Baheti about the probable innovative solutions to increase the jute yield, quality and export. Mr Baheti has delivered an informative and innovative lecture from the knowledge of his long association with jute industries. He strongly believes that the natural fibre like jute will never die because of different eco-friendly products and large employment generation. Only need is the innovative and commercially viable product development; good and user-friendly manufacturing facilities with quality control and efficient management system. Diversification is the only way of survival of jute industries with better quality control and faster and reliable testing opportunities. He stressed upon the improvement of fibre quality by better agricultural and post harvest practices or mechanical and chemical intervention to combat the threat of relaxation of GPA by diversification. In his opinion, packaging will remain as major share (about 50%) of production in future also, but not in the present form. There is a huge market of jute based products in the automobile industry, specially composites, in abroad. Furthermore, jute based geotextile, agrotextile, floorcovering, lifestyle product will grow in future. He also emphasised that quality and cost are the main criteria for marketability and to achieve that there is no need to restrict the products in 100% natural fibres. At the end, an enthusiastic interaction with NIRJAFT and CRIJAF scientists has taken place. He is hopeful that in future days, slowly the mandatory packaging act will be eliminated and most of the Indian jute mills will be able to solve this problem. He appreciated the products and instruments developed by NIRJAFT and expressed that most of these technologies can be commercially viable by up scaling and providing complete package of practices of

production with cost structure. Mr Baheti committed to help in research of NIRJAFT scientists providing facility in his mill. Director, NIRJAFT is proposed for a MOU with Gloster Industries Ltd. in this regard and Mr Baheti agreed upon it.

Foundation Day Celebration

NIRJAFT celebrated the 77th Foundation Day on January 3, 2014. The program was chaired by Dr. K.K. Satapathy, former Director, NIRJAFT, Kolkata. Welcome address was delivered by Dr. D. Nag, Director, NIRJAFT. The Foundation Day Lecture was delivered by Dr. P. Chandra, Professor, National Institute of Food Technology Entrepreneur Management (NIFTEM), Govt. of India and Ex-Director, Central Institute of Agricultural Engineering, Bhopal. He delivered an informative lecture on "Sustainability of jute and allied fibres value chain". He expressed a great hope in the diversified use of jute and allied fibres. In the occasion of foundation day, few retired scientists of NIRJAFT addressed the gathering with their rich experience on working and research. The first issue of in-house journal in Hindi titled "Debanjali" was also released on this occasion.

Institute Management Committee (IMC) Meeting

The 66th Institute Management Committee meeting was held on April 30, 2014 at NIRJAFT under the Chairmanship of Dr. D. Nag, Director of the Institute. The meeting was attended by the members, viz, Dr. K. K. Singh, Assistant Director General (Process Engineering), ICAR; Dr. P G Patil, Head, TOT, CIRCOT, Mumbai; Dr S N Jha, Director, CIPHET, Ludhiana; Dr. (Prof.) S. M. Chatterjee, Ex-Vice Chancellor, BESU, WB; Dr. S. D. Deshpande, Principal Scientist (AS & PE), CIAE, Bhopal; Mr. P. K. Nayek, AFAO, CRIJAF, Barrackpore, WB; Mr. Paritosh Bhattacharya, Director of Agriculture & Ex-Officio Secretary (Agriculture), GoWB; Prof. Asit Chakraborty, BCKV, WB; Dr Gorakhanath Mishra, General Secretary, Rastriya Chatkal Majdur Union, WB; Mr K P Nath, SF&AO, CIFRI, WB; Mr. Rajeev Lal, Member Secretary, IMC and CAO, NIRJAFT, Kolkata. All Head of the Divisions, In-charges of different cells and AFAO of NIRJAFT were also attended the meeting as invitee. The Chairman, IMC, welcomed all members to the meeting. The Member Secretary presented the proceedings of the 65th IMC meeting and Action Taken Report for recommendation. In the meeting, the following items was discussed: creation of modern museum, up-gradation of library, equipments required, furniture required, adoption of CGHS scheme etc. As suggested by council, Dr S K Banik, PS, QEI Div. was delivered a lecture on 'Fungal Dry Retting of Jute - A New Concept'.

Research Advisory Committee (RAC) Meeting

XXIV Research Advisory Committee (RAC) Meeting was held on March 24-25, 2015 under the Chairmanship of Dr. S. Sreenivasan, Former Director, CIRCOT in presence of other RAC members Dr. D. Nag, Director, NIRJAFT; Dr D. Dingra, ICAR representative; Dr. D. Sur, Ex Dy. Director, IJIRA; Dr. S. C. Ray, Prof., DJFST, University of Calcutta; Dr. S. K. Chandra, Ex-Director, Hukumchand Jute Mill, Naihati. The Institute Management Committee (IMC) members, Sh. L.M. Roy, Former Professor, DJFT, University of Calcutta, Sh. P. Chattopadhyay, Chief Executive, Champdani Industries Ltd., Hooghly, W.B. were attended the meeting. Dr. S. N. Chattopadhyay, P.S., NIRJAFT as Member Secretary was also present.

Dr. S. Sreenivasan welcomed all the members present in the meeting and emphasized the need based research. Dr. D. Nag, Director, NIRJAFT made a presentation on the present status of scientific, technical, administrative and supporting staff with regard to the cadre strength and vacancies. The RAC strongly felt the need for immediate address to depletion in scientific manpower and suggested to find ways and means to fill up the vacant positions.

Institute Technology Management Committee (ITMC) Meeting

The meeting of Institute Technology Management Committee were held on May 19, 2014, September 16, 2014, February 06, 2015 and March 11, 2015. The meetings were chaired by Dr. D. Nag, Director, NIRJAFT. In those meetings, mainly the patent (present and past) related matters, technology profile preparation and technology valuation was discussed.

Institute Research Committee (IRC) meeting

The XII-6 IRC meeting was held on September 26-27, 2014 under the chairmanship of Dr D Nag, Director, NIRJAFT in presence of Dr. Prabal Majumdar, Formar Head, Government College of Engineering &Textile Technology (GCETT), Serampore; Prof. Siddhartha Sengupta, GCETT, Bahrampore; Dr Debabrata Chakraborty, Professor, Rajabazar Science College, Calcutta University; Dr Asim Roychoudhury, Ex-professor, GCETT, Serampore; Dr S K Biswas, Ex-Director, Jute development; Prof Rintu Banerjee, IIT, Kharagpore; Dr Bidyut Mukherjee, Ex- Head, TOT, IJIRA and Dr Debabrata Bose, Head, Extension, BCKV, WB. Twenty on-going projects were discussed at length in two days and suggestions of experts has been incorporated in future programmes of those projects.

XII-7 Pre-IRC meeting was held under the chairmanship of the Director, NIRJAFT on March 07, 2015 for discussion on new project proposals in presence of four experts i.e. Prof S K Sett, Department of Jute & Fibre Technology, University of Calcutta; Prof D Chakrabarty, Rajabazar Science College; Dr B K Mukherjee, Ex-Deputy Director, IJIRA and Prof Rintu Banerjee, IIT, Kharagpur. Four ongoing ad hoc projects and eight new ad-hoc projects were discussed elaborately in this meeting and opinions were collected from the experts.

Project Monitoring and Evaluation Committee (PMEC) Meeting

On March 10,2015, the PME committee under the Chairmanship of Dr D Nag, Director, NIRJAFT critically reviewed the observations of XII-7 Pre-IRC meeting on each individual project for approving them with effect from April 01, 2015 subjected to consideration of Research Advisory Committee (RAC).

Institute Joint Council (IJC) Meeting

The IJC meeting was held on April 10, 2014 and March 27, 2015 under the Chairmanship of Dr. D. Nag, Director, NIRJAFT. Dr. S. N. Chattopadhyay, Member Secretary, IJC read out the following agenda items and discussed in detail: Alternate location for IJC office, Liveries for the staffs, Seating arrangement for the staff, Operation of externally funded projects, Filling up of the vacant posts, PF advance, Recruitment of telephone operator etc.

Inauguration of TINFS office

The office room of The Indian Fibre Society (TINFS) was inaugurated by Dr Subrata Gupta, The Hon'ble Jute Commissioner, Govt of India in the premises of NIRJAFT on August 14, 2014 in presence of Dr P Y Rajendrakumar, DG, National Library; Mr S P Bakshi, Secretary, IJMA; Dr D Nag, President, TINFS and Director, NIRJAFT and Dr S Satapathy, Ex- President, TINFS and Ex-Director, NIRJAFT. In this occasion, some of the active committee members of the International conference on Natural fibres during Aug 1-3, 2014 were felicitated for their significant contribution.

Independence Day Celebration

NIRJAFT celebrated The Independence Day on August 15, 2014 at the office premises organised by the security staffs. Dr. D. Nag, Director of the institute hoisted the flag in presence of all staff members of the institute. In his speech, he wished all a happy independence day and reminded the sacrifices of freedom fighters for achieving this moment of glory. Cultural programme was organized by staff members on this occasion along with the National Song.

Vigilance Awareness

NIRJAFT has observed Vigilance Awareness Week from October 27 to November 1, 2014. On October 27, 2014 an oath taking ceremony was held in presence of Dr. G. Bose, Vigilance Officer of NIRJAFT. He emphasized that all the staff members should be transparent in their work and also expressed that vigilance is not only concerned with financial matter but also with other quality of works. Vigilance is an important component of transparency and efficient work culture. During that period, debate and essay writing competition on Anti-corruption was organised among the staff members of NIRJAFT.

Swachh Bharat Abhiyan

The staff members of NIRJAFT has celebrated Swachh Bharat Abhiyan on October 2, 2014 by taking oath and cleaning the institute and surroundings. On January 1, 2015, staffs of NIRJAFT formed a Human chain with an oath that they will keep the institute and its surroundings clean. After that, a long term policy has been decided which will be performed by a committee formed by Director, NIRJAFT.

Implementation of FMS-MIS

NIRJAFT is under fully computerized Financial Management system and Management Information System (FMS-MIS) since November 3, 2014. To implement this, a month wide practical training has been organized for staffs of NIRJAFT

Rashtriya Ekta Diwas

NIRJAFT staffs celebrated Rashtriya Ekta Diwas (National Unity Day) on October 31, 2014 by taking an oath in presence of Director and Chief Administrative Officer, NIRJAFT.

Memorandum of Understanding (MOU) signed

Name of the Company	Date	Understanding
M/s Milltex Engineers, 8/68-69, Sundaresa Layout, Trichy Road, Coimbatore 641018	Aug 05, 2014	Mutual technical support for Implementation of Design & Development of Indigenous Needle punched nonwoven machine
Indian Institute of Engineering Science & Technology, Shibpur, Howrah-711 103	Sept 25, 2014	Equal sharing of benefits and liabilities of jointly developed technology.

Memorandum of Agreement (MOA) Signed

Name of the Company	Date	Amount (Rs)	Technology
M/s Milltex Engineers, M/s Milltex Ecofibres Pvt Ltd, 8/68-69, Sundaresa Layout, Trichy Road, Coimbatore 641018	Oct 14, 2014	25,000	Jute based agrotextiles
		25,000	light weight nonwoven fabrics
		25,000	Jute based decorative handloom fabric for dress materials
		25,000	Jute based handmade paper

Participation in Exhibition

NIRJAFT participated and displayed its developed power ribboner & fibre quality analysis instruments in the exhibition held during the All India Seminar on "Appropriate farm mechanization for marginal & small farmers" on August 8-9, 2014 at Kolkata organized by the Agricultural Engineering Division, West Bengal State Centre, Institution of Engineers (India). The Chief Guest Prof. C. R. Kole, VC, BCKV has inaugurated the NIRJAFT stall and appreciated the initiatives taken at NIRJAFT for developing these machineries and instruments.

NIRJAFT participated and displayed its R&D products and technologies in the "ASC India Expo" which was held in 12th Agricultural Science Congress organized by National Academy of Agricultural Sciences (NAAS), New Delhi during February 3-6, 2015 at ICAR-NDRI Campus, Karnal, Haryana. The products exhibited were highly appreciated by farmers, researchers, academicians, entrepreneurs and other delegates.

NIRJAFT participated at "Krishi Unnayan Mela" organized by Confederation of Indian Industry (CII), Eastern Region in association with Department of Agriculture, Govt. of West Bengal at Bidhan Chandra Krishi Viswavidyalaya (Mohanpur),West Bengal during November 5-7, 2014. The exhibits were highly appreciated by the visitors.

Sensitization Program on IPR related Issues

The ZITMU of NIRJAFT, Kolkata organized a one day Sensitization Programme on IPR Issues on September 12, 2014. The objective of the programme was to sensitize the scientists, Research Associates, SRFs and technical staffs of the ICAR Institutes, Regional Research stations and Zonal Project Directorate situated in West Bengal about Intellectual Property related issues. In this occasion, Mr Anjan Sen, Patent Attorney & IPR Advocate of Anjan Sen & Associates, was elucidated the various forms of Intellectual Property Rights. In another presentation, Dr S K Mitra, Deputy Controller of Patent and Designs, The Patent Office, Kolkata was discussed on 'IPRs and Patenting Procedure in India and Abroad'.

Standing Advisory Committee (SAC) Meeting

The SAC meeting of ZTM-BPD UNIT, NIRJAFT (ICAR) was held on June 26, 2014 at NIRJAFT under the chairmanship of Dr. D. Nag, Director, NIRJAFT & Consortium Leader, in presence of Dr. Suresh Agarwal, DGM, Agri-Business Unit, SBI; Mr. M. Bandopadhyay, Asst. Dev. Officer, KVIC and Mr. Debanjan Dutta, MD, WEBCON. Post NAIP activities of BIC and BPD Unit, Entrepreneurship Development programmes (EDP) through bank, Product exhibition at Rural Self Employment Training Institutes (RSETI), PMEGP Projects, SFURTI Scheme and Cluster development schemes of KVIC and Difficulties faced by Entrepreneurs to get funding for their projects were discussed.

Inauguration of 'Zonal Technology Display Centre'

Zonal Technology Display Centre was inaugurated at NIRJAFT by Dr S K Mitra, Deputy Controller of Patent and Designs, The Patent Office, Kolkata on September 12, 2014. The aim of this centre is to showcase the commercially viable technologies of the 16 Catchment Institutes under ZTMC - East zone.

Exhibit-cum-Sales corner at NIRJAFT, Kolkata

In order to showcase, sell and promote the diversified products developed from Jute & allied fibres at NIRJAFT, an Exhibit-cum-Sales corner was opened at NIRJAFT premises on April 30, 2014. Some products made by trainees of the Institute were put up on display and sale. Inaugurating the outlet, Dr. K. K. Singh, ADG (Process Engineering), ICAR congratulated Dr. Debasis Nag, Director, NIRJAFT for this new initiative.

Zonal Institutes'Technology Management Committee (ZITMC- East zone) Meeting

Annual Meet of ZITMC- East zone was held at NIRJAFT, Kolkata on September 12, 2014 in presence of Dr. Arun Kumar Singh (Chairman , ITMU, ICAR-RC-ER, Ranchi), Dr. D. Nag (Director, NIRJAFT), Dr. A. Pattanayek (Incharge ITMU, ICAR-NEH, Umaim), Dr. M. Padmavati (Associate Professor, IIT, Kharagpur), Dr. S. K. Mitra (Deputy Controller, Indian Patent Office), Dr. P. Swain (Incharge ITMU,

CIFA, Bhubaneswar), Dr. S. D. Sharma (Senior Scientist, IP & TM Unit, ICAR Hq), Dr. A. N. Roy (Member Secretary, ZITMC - Eastzone). Development of framework for Technology valuation and benefit sharing, IP audit, Framework of upcoming NAEP scheme were discussed in the meeting.

Frontline Demonstration

Around 400 jute farmers were participated in Accelerated Jute Retting Demonstration at Katwa of West Bengal; Bechimari, Moirabari and Kaliabor of Assam; Kishanganj, Pratapganj and Tribeniganj of Bihar in collaboration with Jute Corporation of India.

Around 600 jute farmers were demonstrated with Fungal Dry Retting of jute in collaboration with National Food Security Mission (NFSM) at Champadanga, Horipal, Jirat of Hooghly dist; Baduria, Bagda, Berachampa, Bagjola of North 24 Parganas dist.; Bethuadahari, Nazirpur of Nadia dist.; Kalna of Burdwan dist.; Kaladanga of Murshidabad dist.

ICAR-National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT), Kolkata has developed a better and user friendly technology for improved retting of jute. The formulation contains nutrients which enhance microbial growth of retting water at a suitable pH which in turn accelerates the rate of retting. The Institute conducted a number of frontline demonstrations on accelerated retting of Jute at Katwa (West Bengal), Bechimari, Moirabari, Kaliabor (Assam) and Kishanganj, Pratapganj, Tribeniganj (Bihar) in collaboration with Jute Corporation of India (JCI). In October and November 2014, trial on mesta retting was conducted at Bobbili and Ponduru near Vizianagaram at Andhra Pradesh. Overwhelming response was received from the farmers of these areas. As on date around 600 jute farmers witnessed the demonstrations at different DPC of Jute Corporation of India. From these trials, at least two grade upliftment of the grades of mesta was prevailed using the NIRJAFT technology. The local media covered the events and published the news with greater emphasize on accelerated retting of mesta.

Participation in workshop at Philippines

Dr. Laxmikanta Nayak, Senior Scientist was attended the International Workshop on "Innovative Extension Services to Improve Agricultural Productivity" held during November 17-21, 2014 at Manila, Philippines. The workshop was organized by The Development Academy of the Philippines (DAP) in cooperation with the Asian Productivity Organization (APO). Twenty Nine participants from thirteen different APO member countries were participated. Moreover, Dr. Nayak also visited International Rice Research Institute (IRRI), Los Banos, Laguna and MFI Foundation Farm Business Institute, Rizal in the same visit.

Official Language Implementation Committee (OLIC) Meeting

Four OLIC meeting, one in each quarter was held on June 18, 2014; August 05 ; December 06, 2014 and March 16, 2015 under the chairmanship of Dr. D. Nag, Director, NIRJAFT. The main discussion was to increase the correspondence in Hindi for achieving the required target, the celebration of Hindi Fortnight, various points regarding increase of hindi usage was mainly discussed in the meetings.

Hindi Fortnight Celebration

Hindi Fortnight Celebration was organised in the institute from September 15 - 29, 2014. A competition of best innovative ideas pertinent to institutes activities was organized on September 15, 2014. Extempore, debate and recitation competitions were organized for the staffs of the institute during this period. The closing ceremony was held on September 29, 2014 under the chairmanship of Dr. D. Nag, Director, NIRJAFT. Prof. Soma Bandyopadhyay, Head of Department, Hindi Department, Calcutta University graced the occasion as Chief Guest. Prof. Bandyopadhyay in her key note address suggested to perform the official paperwork in our national language. She pointed to use Hindi with caution during translation so that proper meaning should be expressed without any confusion. She also appreciated the enthusiasm of the staff members for participating in different competitions during Hindi Fortnight Celebration. Dr. G. Bose, In-charge, Administration informed in his speech that there are lots of tools available and may be downloaded free of cost for comfortably working in Hindi. Dr. D. Nag in his presidential address expressed that working in bilingual form viz Hindi-English is not only the duty of Hindi Section but also it is a constitutional responsibility of each employee that they should render their official works originally in Hindi to the maximum extent. He also informed that our Institute is going to publish first volume of Hindi Magazine "Devanjali". He discussed the importance of Hindi in communication with reference to national integrity.

Training/ Workshop Organised

Program	Collaboration with/ Sponsored by	Venue	Duration	Participants
Training on "Jute Handicrafts"	NIRJAFT TSP Programme 2013-2014 and Uttar Dinajpur Krishi Vigyan Kendra, Chopra, Uttar Dinajpur, West Bengal	Uttar Dinajpur Krishi Vigyan Kendra, Chopra	Mar 25 - April 8	29 women from ST community of Uttar Dinajpur, West Bengal
Short term (1 month) training on Jute handicraft (3 nos) and Jute bags (7 Nos.)	Development Commissioner (Handicraft) Ministry of Textile, Government of India	NIRJAFT, Kolkata	May –Feb	100
Long term (3 months) training on Jute handicraft (1 no.) and Jute bags (2 No.)	Development Commissioner (Handicraft) Ministry of Textile, Government of India	NIRJAFT, Kolkata	May –Jan	30
Hindi Workshop on 'Official Language Policy of the Govt of India and Hindi Noting & Drafting'	Department of Official Language, Ministry of Home Affairs, Government of India	NIRJAFT, Kolkata	May 24	21
National Level Training Programmes on 'Production and retting technology of jute/mesta/ramie/ sunnhemp including other related aspects'	National Food Security Mission (NFSM), Commercial Crops, Department of Agriculture & Co -operation, Ministry of Agriculture, Govt. of India	NIRJAFT, Kolkata	Aug. 20-22; Sept. 8 -10; Sept. 15-17; Sept. 22 -24	100 and state level agricultural departmental staff
Hindi Workshop on 'Official language Policy of the Govt of India and Implementation'	Department of Official Language, Ministry of Home Affairs, Government of India	NIRJAFT, Kolkata	Aug 23	25
Microbial Retting of Jute and Value addition	–	NIRJAFT, Kolkata	Aug. 25 - 29	13
Training program on 'Bleaching & Dyeing of Jute Yarn '	ICAR	NIRJAFT, Kolkata	Oct. 27–Nov.1	12 small scale entrepreneurs
Model Training program on 'Value addition through product diversification in jute & allied fibres'	Directorate of Extension, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India	NIRJAFT, Kolkata	Nov. 10-17	20 State level Agriculture officers, Scientists, lecturers and officers of SAU and ICAR Institutes.
National level Trainers' Training programme on 'Retting process of Jute fibre'	National Food Security Mission (NFSM), Commercial Crops, Department of Agriculture & Co - operation, Ministry of Ag riculture, Govt. of India	NIRJAFT, Kolkata	Nov. 11 - 17	13

Program	Collaboration with/ Sponsored by	Venue	Duration	Participants
Hindi Workshop on "Hindi as an Official language"	Department of Official Language, Ministry of Home Affairs, Government of India	NIRJAFT, Kolkata	Nov. 22	17
Training programme on 'Weaving of Jute -based yarn'	NIRJAFT's North - East component in collaboration with ICAR - NRC Yak, Dirang	NIRJAFT Kolkata	Jan. 15-24	6 tribal persons
Institute Industry Interface Workshop on 'Newly developed instruments of NIRJAFT'	NIRJAFT, Kolkata; IIEST, Shibpur, Howrah and DST, New Delhi	NIRJAFT Kolkata	Feb. 12	Ninety five delegates from 28 different organizations
Training programmes on 'Promotion of Jute Felt for Augmentation of Agricultural Production in Tribal Dominated Area of Paschim Medinipur'	Tribal Sub Plan of ICAR - NIRJAFT, Kolkata in collaboration with Sevabharati Krishi Vigyan Kendra Kapgari, Paschim Medinipur	Kapgari, Paschim Medinipur	Feb. 20 -22 Feb 26 - 28 Mar 2 - 4	90 ST farmers (58 Male and 32 Female)
Hindi Workshop on 'Noting, drafting and correspondence in Hindi'	Department of Official Language, Ministry of Home Affairs, Government of India	NIRJAFT, Kolkata	Feb. 21	24
Advisory body meeting of the National Funded Project NFBSFARA/ FQ - 3030	NFBSFARA, ICAR, New Delhi	NIRJAFT, Kolkata	Oct. 18	8

HINDI WORKSHOP

Date	Subject	Name of Expert	Items covered	No of participants
August 23, 2014	Official language policy of the union and implementation	Dr. Ramesh Mohan Jha, Hindi Teaching scheme, Depar tment of Official Language, Ministry of Home Affairs, Government of India	Policy and implementation of Hindi in India	20
November 22, 2014	Hindi as an official language	Mrs. Rita Bhattacharya, former Chief Manager (Official Language), UBI and former Member -Secretary TOLIC (Bank)	Rajbhasha Niyam, Adhiniyam, Article related to Official Language in the constitution of India, spelling mistakes, noting and drafting	17
February 21, 2015	Noting, Drafting and Correspondence in Hindi	Mrs. Manju Sirin, Assistant Director, Hindi Teaching Scheme, Ministry of Home Affairs, Government of India	Routine notes to be used in daily administrative works and Hindi Drafting	24

Presentation in Seminar/ Conference/ Workshop/ Meeting

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- Das S., Wireless sensor networks for climate management systems, 347-355.
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- Sengupta S., Jute non-woven fabric manufacture and product diversification, 124-136.
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Seminar/ Conference/ Workshop/ Training/ Meeting Attended

Subject	Organised by/ Venue	Date	Participant
Interactive Meeting of Directors on presentation of SFC/EFC of NIRJAFT, Kolkata	ICAR at Krishi Bhawan, New Delhi	April 7, 2014	Dr. D. Nag
Interactive Programme on 'Sustainable Agriculture'	Green Chain and Nitrofix Laboratories at NIRJAFT	April 25, 2014	All scientists and technical officers
Directors' and Vice-Chancellors' Conference	NASC Complex, New Delhi	April 28, 2014	Dr. D. Nag
Indo-Czech International Conference on 'Advancements in Specialty Textiles and their Applications in Material Engineering and Medical Sciences'	Department of Textile Technology & Fashion technology, Kumaraguru College of Technology, Coimbatore, TN	April 29-30, 2014	Dr. S. Debnath Dr. L. Ammayappan Mr. Seiko Jose
Meeting of National Jute Board (NJB)	Min. of Textiles, GoI, New Delhi	May 15, Sept. 19, Feb. 25, 2014	Dr. D. Nag
Agri Innovation Conclave	NAIP-ICAR at A P Shinde Symposium Hall, NASC Complex, New Delhi	May 18-19, 2014	Dr. A. N. Roy
Workshop on Retting Technology	CRIJAF, Barrackpore	May 22, 2014	Dr. D. Nag Dr. B. Saha, Dr. D. P. Ray
Technical Workshop on 'Materials And Supply Chain Management '	Centre for Training and Social Research at Hotel The Connaught, New Delhi	May 22-23, 2014	Dr. S. B. Roy
Seminar on 'Tools for prototyping controls and high-end measurements '	National Instruments (India) at Hotel Hindusthan International, Kolkata	May 27, 2014	Dr. S. Debnath
Regional Level Workshop on Handicrafts of Eastern Region	Office of the Development Commissioner (Handicraft) at Hotel Sonnet, Salt Lake, Kolkata	June 2-3, 2014	Dr. D. Nag Dr. A. N. Roy
NAAS Foundation Day lecture delivered by Bharat Ratna Dr. C.N.R. Rao	ICAR, NASC Complex, New Delhi	June 5, 2014	Dr. D. Nag
Directors' Conference	NASC Complex, New Delhi	June 6-7, 2014	Dr. D. Nag

Subject	Organised by/ Venue	Date	Participant
International workshop on 'Impact of capacity building programs under NAIP '	NAIP & IFPRI, South Asia Regional Centre at NASC, ICAR, New Delhi	June 6-7, 2014	Dr. L. Ammayappan
Meeting on "Prioritization of researchable issues"	ICAR Research Complex for Eastern Region, Patna	June 8 -9 2014	Dr. B. Saha
Inter District Working Group (IDWG) Meeting	Govt. of West Bengal, Kolkata	June 10, 2014	Dr. D. Nag
Management Development Programme on 'Harnessing Intellectual Property for Strategic , Competitive and Collaborative Advantage '	Kasturbhai Lalbhai Management Development Centre (KLMDC) at Indian Institute of Management, Ahmedabad	June 20-22, 2014	Dr. S. B. Roy
Regional Committee (RC) II Meeting	ICAR, CIFRI, Barrackpore	June 27 -28, 2014	Dr. D. Nag
Council Meeting of Bidhan Chandra Krishi Viswavidyalaya (BCKV)	BCKV, WB	June 30, 2014 Aug. 20, 2014 Oct. 20, 2014 Nov. 3, 2014	Dr. D. Nag
Executive Council meeting	Indian Society of Coastal Agricultural Research at CIFE, Salt lake	July 5, 2014	Dr. B. Saha
Foundation Day Lecture delivered by Sh. Amit Mitra, Hon'ble Finance Minister, Govt. of West Bengal	NABARD , West Bengal Unit	July 12, 2014	Dr. D. Nag
Meeting of the committee to prepare an Inventory of Agricultural Technologies of West Bengal , Andaman & Nicobar Islands	Office of the ZPD, Zone II, Salt Lake, Kolkata	July 19, 2014	Dr. D. Nag Dr. A. N. Roy
Interactive Meeting on Jute and Cotton Production scenario	Min. Of Agric., Krishi Bhawan, New Delhi	July 21, 2014	Dr. D. Nag

Subject	Organised by/ Venue	Date	Participant
Talk on 'An innovative approach for implementation of cluster development project at handloom sector ' delivered by Dr Somen Mapder, Officer – in – Charge, Textile Committee, Kolkata and 'Development of jute fibres through enhanced agronomic practices and harness of new technologies' delivered by Shri Anindya Majumder, Business Development Manager, Jute Corporation of India, Kolkata	Textile Engineering Division, The Institution of Engineers (India), Kolkata	July 22, 2014	Dr. N. C. Pan Dr. S. Sengupta
Workshop on 'Design and Technology Intervention in Natural Fibre Product Innovation'	National Institute of Design (NID),Gandhinagar, Gujarat	July 22 -23, 2014	Mr. Seiko Jose
27th Annual General Meeting of Forum of Scientists, Engineers and Technologists (FOSET)	FOSET at The Institution of Engineers (India), Kolkata	July 27, 2014	Dr. N. C. Pan
International Conference on Natural Fibres (Theme: Jute & Allied Fibres)	The Indian Natural Fibre Society in collaboration of NIRJAFT, CRIJAF and National Jute Board at Bhasa Bhavan, Kolkata and The Oberoi Grand, Kolkata	August 1 - 3, 2014	All scientists and technical officers
All India Seminar on 'Appropriate technologies of farm mechanisation for marginal and small farmers'	Agricultural Engineering Division, WBSC, The 2014 Institution of Engineers (India), Kolkata	August 8-9, 2014	Dr D. Nag Dr. G. Roy, Dr. N. C. Pan, Dr. S. Sengupta, Dr. S. B. Roy, Dr. S. Debnath, Dr. L.K. Nayak, Dr. V. B. Shambhu, Dr. S. C. Saha, Mr. S. Jose
Meeting of Expert Advisory Group (EAG) of Department of Science and Technology (DST), Govt of India on Industrial and Analytical Instrumentation (IDP)	DST at National Centre for Nano Science and Nano Technology, Vidyanagri, Kalina, Santacruz(E), University of Mumbai	August 21 - 22, 2014	Dr. S. Sengupta.

Subject	Organised by/ Venue	Date	Participant
4th ICC – EXIM Summit on Enhancing Exports in key sectors from West Bengal	Indian Chamber of Commerce, Kolkata	August 29, 2014	Dr. D. Nag
Interactive Meeting with Chairman and Committee Members of Commission for Agricultural Costs and Prices (CACP)	Min. of Agri., Govt. of India, Jute Corporation of India (JCI), Kolkata	September 12, 2014	Dr. D. Nag
Sensitization Programme on IPR related issues	ZTMC East Zone at NIRJAFT, Kolkata	September 12, 2014	All scientists and technical officers
Scientific Advisory Committee Meeting of 'Sasya Shyamala' KVK Ramakrishna Mission Vivekananda University, Narendrapur, West Bengal	Sasya Shyamala at Seminar hall, Faculty Centre of Integrated Rural Development and Management, Ramakrishna Mission Vivekananda University, Narendrapur	September 19, 2014	Dr. A. N. Roy
Brain storming session on "Sustainability of Indian Jute Industries in the present circumstances of relaxation of JPMA"	Shri Samir Kumar Chandra, Chief Executive (Works) and Director of M/s Hukum Chand Jute Mills of Hooghly Infrastructure Pvt Ltd. organised byInstitute Innovation Cell at NIRJAFT	September 20, 2014	All scientists and technical officers
3rd Interface Meeting on Improvement of Yak husbandry and upliftment of socio-economic status of yak rears in the country	ICAR - NRC on Yak at Deputy Commissioner's Conference Hall, Leh, J & K	September 22 - 24, 2014	Dr. A. N. Roy
Interactive Meeting with Professor and Faculty Members of National Institute of Design (NID)	Min.of Commerce & Industry, GoI, Ahmedabad & NJB, Kolkata	September 22, 2014	Dr. D. Nag
National level training program on "production and retting quality of Jute/Mesta/Ramie/Sunhemp including their quality aspects"	National Food security Mission (NFSM), Commercial Crops at NIRJAFT, Kolkata	September 22-24, 2014	Mr. Seiko Jose

Subject	Organised by/ Venue	Date	Participant
Interactive Meeting with Union Min. of State for Textiles and Union Min. of Commerce and Industries	Govt. of India, Kolkata	October 11, 2014	Dr. D. Nag
Workshop for Liaison Officer for Sc / ST -WLO (SC / ST)	ISTM, New Delhi	October 20 - 21, 2014	Dr. S. C. Saha
Mid -term Review Workshop for RFD 2014 -2015	Agricultural Engineering Division at ICAR -IASRI, New Delhi	October 21, 2014	Dr. N. C. Pan
Interactive Meeting of Directors with Secretary, DARE and Director General, ICAR for presentation of VISION – 2050	Krishi Bhawan, New Delhi	October 27-28, 2014	Dr. D. Nag
Krishi Unnayan Mela to promote the state as a technology friendly state in agricultural sector.	Confederation of Indian Industry (CII), Eastern Region in association with Department of Agriculture, Govt. of West Bengal at BCKV, Mohanpur (W.B.)	November 5 - 7, 2014	Dr. V. B. Shambhu
Seminar on Krishi Unnyan Pathshala	CII (EZ) and Deptt. of Agri., Govt. of West Bengal	November 6-7, 2014	Dr. D. Nag
International Conference on 'Technical Textiles and Nonwovens'	IIT, Delhi	November 6-8, 2014	Dr. S. N. Chattopadhyay, Dr. S. Sengupta
Meeting with CMD, JCI on enhancing production and quality of jute seeds	JCI office, Kolkata	November 10, 2014	Dr. B. Saha
Second C R Nodder Memorial Lecture	Dr V Subramaniaum, Ex-Professor, Anna University, Chennai, organised by NIRJAFT, Kolkata.	November 11, 2014	All scientists and technical officers
Training on ICAR ERP (FMS/MIS)	NIRJAFT, Kolkata	November, 2014	
Seminar on Agriculture and Food Processing : Opportunities and Challenges - Focus Eastern India	Min. of Food Processing Industries, Govt. of India and Bengal Chamber of Commerce, Kolkata	November 10-11, 2014	Dr. D. Nag

Subject	Organised by/ Venue	Date	Participant
Capacity Building Programme on 'Commodity Future Market for State & Central Government Officers'	NABARD Consultancy Services Pvt. Ltd. at ICMARD, Kolkata	November 10-11, 2014	Dr. S. B. Roy
Model training course on 'Value addition through product diversification in jute and allied fibres'	Directorate of Extension, Dept of Agriculture and Cooperation, Ministry of Agriculture, Govt, of India at NIRJAFT, Kolkata.	November 10-17, 2014	Mr. Seiko Jose
National Seminar on 'Biopolymers & Green Composites –Emerging Science & Technology'	CBPST (A Unit Of CIPET) at Kochi	November 14, 2014	Mrs. D. Mondal
International workshop on 'Innovative Extension Services to Improve Agricultural Productivity'	Development Academy of the Philippines (DAP) in cooperation with the Asian Productivity Organization (APO). at Manila, Philippines	November 17-21, 2014	Dr. L. K. Nayak
Workshop cum training on CeRA	ICAR -DKMA, Delhi at ICAR -NRC on Pig, Guwahati	November 19, 2014	Mr. S. Das
Indo-French collaboration meeting	Cultivation of Science, Kolkata	November 21, 2014	Dr. D. Nag Dr. B. Saha
Meeting on 'Sustainable management of natural resources for improvement of north -western region of Burdwan district'	Budbud centre of CRIJAF	November 25, 2014	Dr. B. Saha
Workshop on 'Library automation in the era of information technology'	NIRJAFT, Kolkata	November 26, 2014	All scientists and technical officers
Seminar on 'Transforming Eastern India's Economy through Innovative Rural Business Hubs'	Confederation of Indian Industry (CII) at Hotel Gateway, Kolkata	November 26, 2014	Dr. D. Nag Dr. L. K. Nayak
35th Convocation of National Institute of Design (NID), Ahmedabad as Special Guest	National Institute of Design (NID), Ahmedabad	Dec 9, 2014	Dr. D. Nag

Subject	Organised by/ Venue	Date	Participant
Global Textile Conference INTEXCON 2014	Diagonal Consulting (India), Gandhinagar, Gujrat	December 10-11, 2014	Dr. D. Nag
Dairy Mela on Golden Jubilee Celebration of the Station.	ICAR -ESR -NDRI at Kalyani, Muratipur, Nadia	December 11, 2014	Dr. V. B. Shambhu
Meeting of State Level Advisory Board (SLAB) of MSME of West Bengal	MSME -DI, Kolkata	December 17, 2014	Dr. D. Nag
Seminar on 'Role of Agricultural Engineers in Government Services of West Bengal'	Indian Society of Agricultural Engineers (ISAE), Kolkata at BCKV, Kalyani.	December 19, 2014	Dr.L. K. Nayak Dr. V. B. Shambhu
Jute Convention (Jute for Now. Jute for the Future)	National Jute Board and Indian Chamber of Commerce at The Lalit Great Eastern, Kolkata	December 23-24, 2014	Dr. D. Nag Dr. G. Bose, Dr. A. N. Roy
Meeting of the Sub- committee on Jute Diversification and Incubation Centre	National Jute Board, Kolkata	December 23, 2014	Dr. D. Nag
77th Foundation Day Lecture by Dr P Chandra, Ex - ADG, ICAR, New Delhi and 4th Dr P B Sarkar Memorial Lecture delivered by Dr S K Sett, Ex Principal GCETT, Serampore, West Bengal.	ICA R-NIRJAFT, Kolkata	January 3, 2015	All scientists and technical officers
Indian Science Congress	ISCA at Mumbai	January 3 -7, 2015	Dr. G. Roy
Seminar on 'DST-Lockheed Martin India Innovation Growth Programme'	Federation of Indian Chamber of Commerce (FICCI) at Hotel The Lalit Great Eastern, Kolkata	January 13, 2015	Dr. N. C. Pan Dr. S. Sengupta Dr. K. K. Samanta
Meeting for discussion on 'Consortium research project on Natural fibre'	ICAR -CIRCOT, Mumbai	January 15-16, 2015	Dr G Bose, Dr A N Roy, Dr. L. K. Nayak, Dr. D. P. Roy, Dr. L. Ammayappan

Subject	Organised by/ Venue	Date	Participant
S.K. Mukherjee Endowment Lecture delivered by Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR	CRIJAF, Barrackpore	January 17, 2015	Dr. D. Nag
International Symposium on Polymer Science and Technology	IACS, Kolkata	January 23-26, 2015	Dr. D. P. Roy
ASC India Expo held concurrently with 12th Agricultural Science Congress	National Academy of Agricultural Sciences (NAAS) at ICAR - NDRI Campus, Karnal	February 3-6, 2015	Dr. L. K. Nayak
10th All India People's Technology Congress	Rajabazar Science College Kolkata	February 6-7, 2015	Dr. B. Saha
4th Annual Review Workshop of the Project NFBSFARA/FQ -3030	ICAR at NASC Complex, New Delhi	February 10-12, 2015	Dr. D. P. Roy
Industry - Institute Interface Workshop on 'Newly developed low cost instruments for technical textiles'	NIRJAFT & IIEST at NIRJAFT, Kolkata	February 12, 2015	All scientists and technical officers
Seminar on 'The Millennium Alliance'	FICCI & USAID at The Hotel Hindusthan International, Kolkata	February 13,	Dr. S. Debnath
28th Annual Workshop of AINP on Jute and Allied Fibres	ICAR -CRIJAF, Barrackpore	February 13-14, 2015	Dr. D. Nag Dr. S. C. Saha
Seminar on 'Standardization in the field of jute and textile and scope for BIS Certification and HRD need of jute industry'	Institute of Jute Technology and Bureau of Indian Standards at Department of Jute & Fibre Technology, Institute of Jute Technology, University of Calcutta	February 17, 2015	Dr. G. Bose, Dr A. N. Roy Dr. N. C. Pan, DR. S. Sengupta Dr. S. C. Saha
Fourth Annual Review Workshop for projects funded by NASF	NASF at NASC, ICAR, New Delhi	February 19-20, 2015	Dr. L. Ammayappan
Fourth Interactive Meeting on 'Strategic Road Map for Big Data Analytics'	Consultancy Development Centre (CDC) at Centre for soft computing research, Indian Statistical Institute, Kolkata	February 20, 2015	Dr. S. B. Roy

Subject	Organised by/ Venue	Date	Participant
Technology Week & Krishi Mela - 2015	Uttar Dinajpur Krishi Vigyan Kendra, UBKV, Uttar Dinajpur.	February 24, 2015	Dr. S. Debnath
Workshop on 'Training Need Assessment (TNA)'	ICAR at NAARM, Hyderabad	February 26, 2015	Dr. S. B. Roy
Agri Horti - Food Fest, 2015	Department of Food Processing Industries and Horticulture & Department of Agriculture, Government of West Bengal at Netaji Indoor Stadium, Kolkata	February 26-28, 2015	Dr. L. K. Nayak
Inauguration of training on 'Promotion of Jute Felt for Augmentation of Agricultural Production' in Tribal Dominated Area of Paschim Medinipur	ICAR -NIRJAFT and Sevabharati Krishi Bigyan Kendra at Kapgari, Paschim Medinipur	March 2, 2015	Dr. S. Debnath
Industry -Institute Interface Workshop on "Automatic Integrated Jute Grading Instrument"	NIRJAFT, Kolkata	March 13, 2015	All scientists and technical officers
National Workshop cum Training Programme on 'Statistical tools for research data analysis'	BCKV, West Bengal	March 16 -22, 2015	Dr. K. K. Samanta
National training on Technological Advances in Production of Jute and Allied Fibre Crops	CRIJAF and NIRJAFT	March 16 -21, 2015	Dr. S. C. Saha
State Level Marketing Workshop for West Bengal	Office of DC(H), East Zone, Min. of Textiles, Govt. of India, Kolkata	March 17 -18, 2015	Dr. D. Nag
64th National Conference on 'Innovations in textiles'	The Textile Association (India) at Dept. of Jute & Fibre Technology, Institute of Jute Technolgy, University of Calcutta Kolkata	March 28, 2015	Dr. D. Nag Dr. N. C. Pan, Dr. K. K. Samanta

In-house Seminar

Date	Name of Speaker	Topic of Presentation
April 10	Dr. S. Debnath	*Agro -textile: Use of Jute Nonwoven*
	Dr. L. Ammayappan	*Chemical Modification of Jute fabric with sodium hydroxide and its effect on reinforcement of unsaturated polyester resin*
	Shri Seiko Jose	*Fire retardant finish of jute fabric using Nano Zinc Oxide*
May 30	Ms. Nandita Mitra	*Entrepreneurship -A Review*
June 9	Mr. Sujai Das	*Internet Protocol Version 6.0*
	Er. Nilendu Bhowmik	*Journey of Business Planning & Development Unit, NIRJAFT*
June 13	Dr. S.B. Roy	*Materials and Supply chain Management*
July 5	Dr. Surajit Sengupta	*Design and development of instrument for testing electrical behavior of fabric*
	Dr. S.B. Roy	*Intellectual property rights in India*
August 7	Shri Seiko Jose	*Extraction & utilization of Jute & Coconut Fibre*
August 11	Dr. Anwar Alam, ex-DDG (Agri. Engg)	*Prospect of Jute and Allied Fibres*
September 4	Dr. Rakesh Kr. Ghosh	*Project proposal on Development of microcrystalline cellulose from Jute -stick*
	Dr. Surajit Sengupta	*Project proposal on Development of light weight well covered nonwoven fabric*
October 10	Dr. D. Nag	*Prospects of JGT and its variance in domestic and international market*
October 17	Dr. S.N. Chattopadhyayay	*Eco-friendly chemical processing of jute fibre for making technical textiles*
	Dr. S. Sengupta	*Flexural rigidity tester for technical textiles*
November 28	Dr. S.C. Saha	*Role of Liaison Officer of SC/ST/OBC*
December 19	Dr. K.K. Samanta	*Nano and Bio -chemical processing of cellulosic and lingo -cellulosic textiles*
January 21	Dr. D.P. Ray	*Synthesis of low molecular weight compatibilizers (CA-26) for preparation of jute based bio -composites*
February 11	Dr. L.K. Nayak	*Status of Agricultural extension in Asia -Pacific Region*
February 20	Dr. Biplab Saha	*Global initiative on Soil & Water Network*
March 12	Dr. S.B. Roy	*ICAR Training Policy - 2014*

Awards & Recognition

Dr. D. Nag Director	• Nodal Officer, All India Entrance Examination in Agriculture (AIEEA), Kolkata Centre, April 12-13, 2014 • Observer for Asstt. Director (Official Language) Examination, ICAR, Kolkata Centre, Nov. 22, 2014 • Observer for Admin. Officer and Finance & Accounts Officer Examination, ICAR, Kolkata Centre, Nov. 23, 2014 • Observer, ARS (Final) Examinations, ICAR, Kolkata Centre, Dec. 28, 2014 • Chairman, Task Force, User Friendly Jute Grading System, constituted by Jute Commissioner, Min. of Textiles, Govt. of India. • Member, Variety Release Committee, All India Network Project (AINP) on Jute and Allied Fibres, CRIJAF, Barrackpore, West Bengal. • Chairman, Agricultural Engineering Division, West Bengal State Centre, The Institution of Engineers (India) • President, The Indian Natural Fibre Society (TINFS), NIRJAFT, Kolkata. • Chairman, Indian Society of Agricultural Engineers , Kolkata Chapter Member, State Level Advisory Board, (SLAB), Micro, Small and Medium Enterprises (MSME**),** Govt. of West Bengal. • Member, Scientific Advisory Committee of the 'Sasya Shyamala Krishi Vigyan Kendra, Ramkrishna Mission Vivekananda University, Belur Math, Howrah, West Bengal.
Dr A. N. Roy, Principal Scientist & Head, TOT Division	• Nominated as *observer* for the Audit and Accounts Examination of ICAR at CIFRI, Barrackpore July 07-11, 2014.
Dr N. C. Pan, Principal Scientist, CBP Division	• Awarded *Life Membership* of Association of Carbohydrate Chemists and Technologists (India) [ACCTI]. Membership No: LM/242/14 • Acted as *Reviewer* for Indian Journal of Fibre & Textile Research (CSIR)
Dr S. N. Chattopadhyay, Principal Scientist & Incharge, PME Cell	• Awarded *Life Membership* of Association of Carbohydrate Chemists and Technologists (India) [ACCTI]. Membership No: LM/243/14 • Acted as *reviewer* of Indian Journal of Fibre & Textile Research (CSIR) • Acted as *External Examiner* of B Tech (Jute & Fibre Technology) of University of Calcutta.

	• Acted as *Editor* of Indian Journal of Natural Fibre, Published by The Indian Natural Fibre Society, Kolkata. • Awarded as an *External Examiner* of M Tech in Textile Technology (Technical Textile) of University of Calcutta. • Nominated as a *Member of Institute Management Committee (IMC)* of ICAR-Indian Institute of Natural Resins and Gums, Ranchi, Jharkhand. • Invited as an *Expert* in the field of "Natural fibre and Jute" for Special lecture at The Madhya Pradesh Karigar Science Congress, 2014, organized by M P Council of Science & Technology at Bigyan Bhavan, Bhopal, Madhya Pradesh. • Nominated as *Co-Chairman* of The Textile Engineering Divisional Sub-Committee of the West Bengal State Centre of The Institution of Engineers (India) for the session 2014-15 & 2015-16.
Dr B.Saha, Principal Scientist, QEI Division	• *Presidential member* of 10th All India people's Technology Congress of FOSET at Kolkata. • *Evaluator and External examiner* of Ph. D thesis on "Effect of geo-textiles on soil and water conservation in pitcher irrigated vegetable crops of alfisol"
Dr S. Sengupta, Principal Scientist, MP Division	• Acted as a *member of examiner/paper setter/moderator* of B tech course on Jute & Fibre Technology of Calcutta University. • Acted as a *member of examiner/moderator* of M tech course on Technical Textiles of Calcutta University. • Acted as the *reviewer* of Indian Journal of Fiber and Textile Research (CSIR), Journal of Scientific and Industrial Research (CSIR). Institute of Engineers (I) and Bio-Resources. • Acted as the *Convenor* of the Textile Engg. Division, West Bengal State Centre, The Institution of Engineers (India) • Acted as *joint supervisor* of a Ph. D. student of IIEST, Howrah.
Dr S. Debnath, Senior Scientist, MP Division	• Nominated as *Convenor* of Textile Engineering Divisional Sub-Committee for the Session 2014-2015 and 2015-2016 of West Bengal State Centre, The Institution of Engineers (India). • Selected as *External Examiner* for Ph.D. Synopsis Evaluation of the Ph.D. candidate registered under Textile Designing Department, Banasthali Vidyapith, Rajasthan. • Awarded *Best Poster* on "Effect of pre-treatment of jute fabric with potassium permanganate on the jute polyester based bio-composites"' in International Conference on Natural Fibres (*Theme: Jute & Allied Fibres*) at Kolkata August 1-3, 2014, organized by The Indian Natural Fibre Society. • Acted as *Reviewer* of Journal of Industrial Textiles, Indian Journal of Fibre & Textiles Research, Journal of Fibers and Polymers, Journal of The Institution of Engineers (India): Series E

Dr D. P. Roy, Senior Scientist, QEI Division	• Awarded *best paper* in International Conference on Polymer Science & Technology (MACRO 2015) organized by Royal Society of Chemistry at Kolkata, 23-26 January, 2015, • Acted as *Co-Organizing Secretary* in the Internataional Conference on "Jute and Allied Fibres" organized by The Indian Natural Fibre Society (TINFS) in collaboration with NIRJAFT, Kolkata; CRIJAF, Barrackpore & NJB, Kolkata, August 01-03, 2014 • Acted as *Councillor* of the Society of Plant Protection Sciences, Division of Nematology, IARI, LBS Centre, New Delhi-110 012 • Acted as *Dissertation Supervisor* for the project entitled "Biopesticidal properties of jute seed phytochemicals" carried out by Ms. Sohini Saha under KVPY Fellow Scheme during 2014 • Acted as *External Examiner* for the thesis viva voce of M.Sc. (Ag.) Hons. student of Benaras Hindu University, July 5, 2014. • Acted as *External Examiner* for the thesis viva voce of M.Sc. (Ag.) Hons. student of Calcutta University, West Bengal. • Received *Cash Award* for successfully qualifying the 'Praveen' and 'Pragya examination' during the year 2014 under Hindi Teaching Scheme. • Acted as *Executive Editor* of 'Indian Journal of Natural Fibres' (ISSN: 2348 7445) during 2014-15 • Associated *Chief Editor* of 'International Journal of Agriculture, Environment and Biotechnology' (Print ISSN:0974-1712 online ISSN: 2230-732X, NAAS rating 4.1). • Acted as *Chief Editor* of 'International Journal of Bio-resource Science' (ISSN: 2347 9655) during 2014-15 • Acted as *Mukhya Sampadak* of the Bengali Magazine *Krishi Samachar* (ISSN: 2347 9663) during 2014-15.
Dr L. Ammayappan, Senior Scientist, CBP Division	• Acted as *external examiner* for the Ph.D viva voce examination under Anna University, Chennai, Tamilnadu, September, 2014. • Acted as *peer reviewer* for the following NAAS rated international and national journals, Textile Research Journal, Journal of Industrial Textiles, Fibers and Polymers, International Journal of Biological Macromolecules, Indian Journal of Fiber & Textile Research, Materials Science, Journal of Fashion Technology & Textile Engineering, Textiles and Clothing Sustainability, American Journal of Chemical Engineering. • *Regional Editor* of the international journals "Asian Journal of Textiles" and "Journal of Applied Science" since July 2012 • *Editorial board member* for the journal "Indian Journal of Natural Fibers" since July 2014; for the journal "International Journal of Scientific and Engineering Research" and "Journal of Bioresource Engineering and Technology"

	• Invited *editorial board member* of the International Journal of Green Chemistry, January, 2015. • *Best oral presentation* award for the paper on "Surface modification of jute fibre through potassium permanganate for development of polyester based bio-composites" in the National seminar on 'Biopolymer & Green Composites –Emerging Science & Technology', organized by Centre for Biopolymer Science & Technology, Cochin on November 14, 2014. • *Best poster* award for the paper on "Synthesis of low molecular weight compatiblisers (CA-26) for preparation of Jute based bio-composites" in the International symposium on 'Polymer Science & Technology', Indian Association for the Cultivation of Science, Kolkata on January 23-26, 2015. • *Best poster award* for the paper on " Effect of Pre treatment of Jute Fabric with potassium permanganate on the jute polyester based bio-composites" in the International conference on Natural Fibers-Theme :Jute and Allied Fibers, The Oberai Grand, Kolkata, 1-3 August 2014.
Dr L. K.Nayak, Senior Scientist, TOT Division	• Nominated as *The Convenor*, Agricultural Engineering Divisional Committee of West Bengal State Centre for the Sessions 2014-15 and 2015-16. • Acted as a *Paper Setter cum External Examiner* for the B.Sc. (Ag.) Hons. of Visva-Bharati University, West Bengal. • Acted as a *Reviewer* for the Journal of Root Crops, Thiruvananthapuram.
Mr. Sujai Das, Scientist (Senior Scale), TOT Division	• Awarded *Second Prize* for the article "Second Life" published in "Swarnima-2014" • Awarded by best article award in Sawrnima
Dr R. K. Ghosh, Scientist, CBP Division	• *Jawaharlal Nehru Award* by ICAR for outstanding research in the field of Natural Resource Management category. • Best oral presentation for "Surface modification of jute through treatment with potassium permanganate for development of polyester based biocomposite" on National Seminar on Biopolymer Green Composites Emerging Science & Technology, Nov. 14, 2014, CIPET, Kochi, India. • Best paper award for "Synthesis of Low Molecular Weight Compatibilizers (CA-26) for preparation of Jute Based Biocomposites in the International Conference on Polymer Science & Technology (MARCO 2015) organized by the Royal Society of Chemistry, on Jan. 23-26, 2015, Kolkata, India. • Acted as an expert for analytical method development by GC-MS at ICAR-CTRI, Andhra Pradesh during Nov. 10-14, 2014.

Dr K. K. Samanta, Scientist, CBP Division	• Selected as *one of the top 50 Innovator* in DST-Lockheed Martin "India Innovation Growth Programme" for the promising technology on "Water-free Sustainable Colouration and Functionalization of White and Dyed Textiles, and Garments", March, 2015. • Received *Best Oral Talk* on "Hydrophobic Finishing of Cotton Textile Using Atmospheric Pressure Plasma", in International Conference on Natural Fibres, August 1-3, 2014 at Kolkata, India. • Awarded as *Fellow of The Textile Institute* (CText FTI), Manchester, UK
Seiko Jose Scientist, M P Division	• Received *Best Oral Talk* on "Hydrophobic Finishing of Cotton Textile Using Atmospheric Pressure Plasma", in International Conference on Natural Fibres, August 1-3, 2014 at Kolkata, India. • Awarded first prize in Parish Bulletin Competition for feature 'Linen' at Thrissur district.

86 th. Foundation Day and ICAR Award Ceremony
29 th. July 2014

Research Support Services

Design, Development and Maintenance Section

The objective of the section is to assist in design and development or modification of machinery/prototype, equipment, instruments etc. for research purposes. It is also engaged in customary maintenance of machines and instruments; civil & electrical infrastructure of campus; security aspects, new infrastructure building activities; monitoring of car etc.

The following important works has been carried out during 2014-15.

a) Preventive and breakdown maintenance of machines, instruments, infrastructure, car, air conditioners etc.
b) Coordinated and monitored all forms of civil, electrical, mechanical works, sanitation and plumbing services.
c) Monitored institute vehicle movement and maintenance.
d) Provided others support services like watch and ward and fire fighting.
e) Planning, coordinating & execution of major infrastructure development works of the Institute through external agencies like CPWD, National Council of Science Museums etc.
f) The Master Plan/ Building Plan of all buildings of the institute was prepared and sent to Council in required format.
g) Renovation of the Institute Record room with installation of the Optimizer.
h) Constructed footpath with paver's block near flag post.
i) Provided false ceiling & roof slab of instrument room in QE&I Divn.
j) Provided partition wall along Type-II Qtr. for protection.
k) Repaired roof of Gas plant shed of QE&I Divn.
l) Provided shutter, false ceiling and glass door for Exhibit Display corner of TOT Divn.
m) Provided and fixed of steel lettering of Institute's name with logo in Hindi and regional language at Gate no.-1.
n) Provided bilingual display of ISO certification at Gate no.-2.
o) Refilling of fire extinguishers etc.
p) Regularization of institute land records was initiated by contacting State Land Record Department and Kolkata Municipal Corporation officials.
q) The Briquetting machine and Gassifier Plant were cleaned and serviced for R&D work.

r) Fabricated and assembled different jute grading instruments like Fibre Strength Tester, Air Flow Fineness Tester, Colour & Lustre Metre & Bulk Density Metre.
s) Coconut fibre strength tester has been designed and developed.
t) The Farmers Hostel is also maintained and monitored by this section.

Priority setting, Monitoring & Evaluation (PME) Cell

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

Quality Assurance (QA) Section

This section deals with evaluation of fibre quality and grading of jute and allied fibres. It is also engaged with fibre quality measuring instruments. It is associated with CRIJAF in All India Network Project (AINP) for jute and mesta. The section coordinates the system for acquiring and maintenance of ISO certification of the institute. Quality Assurance Section is working under Quality Evaluation & Improvement Division. Basically this section deals with fibre properties and grading of jute & mesta fibre and doing regular physical tests as a part of many research projects initiated in NIRJAFT, CRIJAF and other organizations including All India Network Project (AINP). The institute is having very good infrastructure for short training programme on

jute grading. Theoretical and practical training on grading methods are provided on demand basis. This training course is conducted to acquaint marketing personnel and other peoples from different organizations and agencies with the BIS specifications on raw jute grading. The section is doing quality evaluation of fibres from different breeding, agronomical and quality trials on jute, mesta, sunnhemp, flax and ramie fibre under All India Network Project (AINP) headed by CRIJAF. These trials were conducted for commercial recommendation with a view to select varieties which produced fibres of good quality and high yield. Recently the section has developed a new user-friendly jute grading system and it is with BIS for recommendation.

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 system of testing of jute, mesta samples received from outside agencies on payment basis has been done regularly. A good number of outside parties have been availing of the testing facilities of this section. This financial year the section earned as revenue of Rs. 3.07 lakhs.

Library

It acts as a centre of repository for scientific and technological information of jute & allied fibres including other ancillary disciplines by maintaining a large number of books, journals, reports, reprints, pamphlets. the library has developed suitable infrastructure for computerized operation.

The following activities have been carried out in addition to regular activities during this year,

a) NIRJAFT library has been made accessible by the members via on line system from anywhere through internet.
b) Preservation of very old, rare and valuable documents and books have done by applying tissue paper lamination technique.
c) A database on Jute & Allied Fibres has been updated to store information.
d) A collection of abstracts on 'Jute & Allied Fibres', Vol. 2, No. 1 & 2 has been published containing information from Jan - Dec, 2013.
e) The library section has developed a model database on CDS/ISIS of UNESCO over Common Communication Format (CCF) with necessary modifications.
f) Digitisation of library is under progress.

One day Library workshop on "A Model Library: In the Era of Information Technology" was organized on November 26, 2014. The Chief Guest was Mr. V. Jayaraman, Librarian and Information Officer National Library. The workshop was inaugurated by lighting of holy lamp. In the welcome address, Dr. D. Nag emphasised on importance of the modern library in the context of advancement of information technology. Dr. V. Jayaraman expressed his gratitude for organising such an important workshop. Dr. S.N. Chattopadhyay told about the contents of the technical session of workshop and proposed a vote of thanks to all the dignitaries and staffs present in the workshop. The technical session was chaired by Dr. Chaitali Dutta, Professor, Department of Library and Information Sciences, Jadavpur University, Kolkata. The technical session consists of deliberation of modern library architecture, e-resources, preservation of old library documents, centralised information dissemination system, on-line remote access etc. Delegates from ICAR-CIFRI, IJIRA, British Library, Asiatic Society, National Library etc. participated in the workshop.

DISTINGUISHED VISITORS

- Mr V Chandramohan, Chief Financial Officer, Senapothy Whiteley and Mr A. K. Basu, General Manager, Senapothy Symons Insulations Pvt. Ltd. visited on April 24, 2014 for discussion on production of paper from jute.

- Dr P B Jhala, Research Advisor, National Institute of Design, Ahmadabad visited NIRJAFT laboratories, display centres, sales corner, pilot plant, incubation centre etc. along with two faculties of NID and Mr M Datta of NJB on September 23, 2014. He has shown keen interest on the technologies and products developed by NIRJAFT. He met all the scientists of NIRJAFT and delivered a lecture on 'Plasma treatment on Angora fibre'.

- Dr Anwar Alam, Ex-DDG (Agricultural Engineering), ICAR and Ex-Vice-Chancellor, S K University of Agriculture Sciences and Technology, Jammu, visited on August 11, 2014 and expressed his views on research of jute and allied fibres to the scientists of NIRJAFT.

- Prof. Suresh Jain, Dept. of Natural Resources, TERI University, New Delhi and Mr Suneel Pandey, Associate Director, Green Growth and Resource Efficiency Div., The Energy and Resources Institute, New Delhi visited with Mr S P Bakshi, Secretary, IJMA on Sept 1, 2014 to discuss the processing and prospect of lignocellulosic fibre.
- A group of 37 students on Textile Design of NIFT, Patna visited NIRJAFT laboratories, pilot plant and products on September11, 2014.

- Dr. K. Alagusudaram, DDG(Engg), ICAR visited on November 11, 2014 and attended Second C R Nodder memorial lecture as Chief Guest. He visited all the laboratories of the institute and interacted with different staffs. He was felicitated by Dr. D. Nag, Director, NIRJAFT. In his address, Dr. Alagusundaram reminded the staffs of the institute regarding contribution of ICAR for providing food to all our

countrymen. He urged all the scientists to contribute their best for improvement of livelihood of jute growers and development of jute industry.

- Prof Ajoy Roy, Founder Director, Indian Institute of Engineering Science & Technology, Shibpur & former Vice-Chancellor, Bengal Engineering and Science University, Howrah visited on February 12.
- Dr Subrata Gupta, Jute Commissioner, Govt of India visited on February 12 and March 13.
- Mr A K Chakravorty, CMD, JCI visited on March 13.
- A group of 25 B.Sc. (Agri) 3rd year students of Biswanath College of Agriculure, Assam Agricultural University, Jorhat, Assam has visited for their educational excursion tour programme on January 28, 2015.

- About 50 students of class VIII and IX from Mansur Habibullah School visited NIRJAFT laboratories and collected a glimpses of jute products on November 5, 2014.

- A group of 20 jute farmers from Purnea, Bihar visited NIRJAFT during their Training-cum-Exposure visit on December 18, 2014.

- About 101 students of Kerela Agricultural University visited on March 23, 2015.

Personnel

As on 31.03.2015

Dr. Debasis Nag	**M. Tech., Ph.D., FIE(I)**	**Director**

Quality Evaluation & Improvement Division

Dr. Gautam Roy	MEE, Ph.D.	Principal Scientist & Head of Division
Dr. Shaymal Banik	M.Sc.(Agri.), Ph.D.	Principal Scientist (retd. on 31.12.2014)
Dr. Biplab Saha	M.Sc., Ph.D.	Principal Scientist
Dr. Avijit Das	M.Sc., Ph.D.	Principal Scientist (joined on 07.06.2014)
Dr. Deb Prasad Roy	M.Sc., Ph.D.	Senior Scientist
Dr. Subhas Ch. Saha	M.Sc., Ph.D.	Senior Scientist
Sh. Kulwant Dahiya	M.Tech.	Scientist
Sh. Arindom Ghosh	B.Sc.	Senior Technical Officer
Sh. Tapas Kr. Ghosh	B.Sc.	Technical Officer

Chemical & Bio-Chemical Division

Dr. Ashim Kr. Roy	M.Sc., Ph.D.	Principal Scientist & Head of Division (retd. on 31/03/2015)
Dr. Nimai Chandra Pan	M.Tech., Ph.D., FIE(I), FTA	Principal Scientist & I/C Administration (from 28.02.2015)
Dr. Sambhu Nath Chattopadhyay	M.Tech., Ph.D., FIE(I), FTA	Principal Scientist
Dr. Lakshmanan Ammayappan	M.Sc., Ph.D.	Senior Scientist
Dr. Rakesh Kr. Ghosh	Msc., Ph.D.	Scientist
Dr. Kartick Kr. Samanta	M.Tech., Ph.D.	Scientist (joined on 25.11.2014)
Sh. Karunamoy Patra	H.S., Dip. in Elec. Engg.	Technical Officer
Sh. Amalesh Khan	B.Sc.	Technical Officer
Sh. Pradip Talukdar	S.F.	Technical Officer
Sh. Basudev Chakraborty	H.S., ITI	Technical Officer

Mechanical Processing Division

Dr. Gautam Basu	M.Tech., Ph.D.(Tech.), FIE(I), PFDJT	Principal Scientist, Head of Division & I/C Administration (till 27.02.2015)
Dr. Surajit Sengupta	M.Tech., Ph.D. (Tech), FIE(I), C. Engg., PGDFM	Principal Scientist
Dr. Sanjoy Debnath	M.Tech., Ph.D., FIE(I)	Senior Scientist
Mr. Seiko Jose	M.Sc.	Scientist
Sh. Kamal Kr. Banerjee	Madhyamik	Technical Officer

Transfer of Technology Division

Dr. Alok Nath Roy	M.Tech., Ph.D.	Principal Scientist & Head of Division
Dr. Samir Baran Roy	M.Sc., Ph.D.	Principal Scientist & I/C ITMU
Dr. Laxmi Kant Nayek	M.Tech., Ph.D.	Senior Scientist
Dr. Vidya Bhushan Sambhu	M.Tech., Ph.D.	Senior Scientist
Sh. Sujai Das	M.Sc.	Scientist (Senior Scale)
Sh. Koushik Mitra	B.A.	Technical Officer

Design Development & Maintenance Section

Dr. Gautam Basu	M.Tech., Ph.D.(Tech.), FIE(I), PFDJT	Principal Scientist & I/C, DDM (till 28.02.2015)
Dr. Surajit Sengupta	M.Tech., Ph.D. (Tech) FIE(I), C. Engg., PGDFM	Principal Scientist & I/C, DDM (from 01.03.2015)
Sh. Prosenjit Sanyal	B.Sc. (Agril. Engg. & Tech.)	Assistant Chief Technical Officer
Sh. Lilamoy Patra	H.S., Dip. in Elec. Engg.	Assistant Chief Technical Officer
Sh. Prabin Chowdhury	S.F., ITI	Technical Officer
Sh. Chanchal Kundu	H.S., Dip in Mechanical Engg.	Technical Officer
Sh. Kartick Chandra Majumder	ITI	Technical Officer

Prioritization, Monitoring and Evaluation Cell

Dr. Sambhu Nath Chattopadhyay	M.Tech., Ph.D., FIE(I), FTA.	Principal Scientist & I/C PME Cell
Dr. Surajit Sengupta	M.Tech., Ph.D. (Tech), FIE(I), C. Engg., PGDFM	Principal Scientist & Member, PME Cell
Dr. Nimai Chandra Pan	M.Tech., Ph.D., FIE(I), FTA	Principal Scientist & Member, PME Cell
Dr. Samir Baran Roy	M.Sc., Ph.D.	Principal Scientist & Member, PME Cell
Dr. Utpal Sen	M.Sc., Ph.D.	Chief Technical Officer
Sh. Himadri Sengupta	Diploma in Textile	Senior Technical Officer
Dr. Debabrata Das	M.Sc., Ph.D.	Senior Technical Officer

Library

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

Administration

Sh. Rajeev Lal	B. Sc. (Hons)	Chief Administrative Officer
Sh. Brindavan Kabi	B.Com.	D.D.O. & A.A.O. (Adm. II) (from 01.12.2015)
Mrs. Anasua Majumder	M.Sc.	A.F & A.O.
Sh. P. K. Purkayastha	P.U.	A.A.O. (Adm. I)
Sh. Swapan Kr. Sinha	B.Com.	A.A.O. (Adm. III)
Sh. Kamalesh Chandra Bose	S.F.	A.A.O. (Adm. II) (retd. on 30.11.2014)
Sh. Balaram Chatterjee	B.Com.	PS to Director

Hindi Cell

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

Financial

A. THE BUDGET PROVISION AND ACTUAL UTILIZATION UNDER PLAN, NON PLAN, NAIP & PLAN SCHEMES DURING 2014-15.

(Amount in Rs)

Sl. No.	Name of Heads	Opening Balance	Fund Received	Actual Utilization	Closing Balance
1.	Non -Plan	8549269	130593000	133191606	**5950663**
2.	Plan	1240578	2697200	27925721	**286857**
3.	NAIP Projects	(-)845914	1584619	1069484	**(-)330779**
4.	Plan Schemes (ITMU & ZTMC)	376071	2112617	2257616	**231072**

B. SUB-HEAD WISE BUDGET PROVISION AND ACTUAL UTILIZATION UNDER INSTITUTE PLAN AND NON PLAN SCHEMES DURING 2014-15.

(Amount in Rs)

Sl. No.	Sub-Head	Plan		Non Plan	
		Budget Provision	Actual Utilization	Budget Provision	Actual Utilization
	A) Revenue Expenditure				
1.	Establishment Expenses	NIL	NIL	92224000	92109348
2.	Pension & Other Retirement Benefits	NIL	NIL	21327000	21323723
3.	Travelling Allowances	1000000	954170	600000	600000
4.	Research & Operational Expenses	3948000	3835143	1100000	919046
5.	Administrative Expenses	12095000	11976041	8851000	8592462
6.	Miscellaneous Expenses	5562000	5560785	403000	399208
	Total of A	**22905000**	**22626005**	**32281000**	**31834439**
	B) Capital Expenditure				
1.	Equipment	2517000	2510149	500000	499660
2.	Works				
3.	Library Books & Journals	50000	49435		
4.	Vehicles				
5.	Furniture & Fixture	1000000	999888	200000	198890
6.	Information Technology	500000	499666		
	Total of B	**4067000**	**4059138**	**700000**	**698550**
	Total (A+B)	**26972000**	**26985009**	**125205000**	**124642337**

BALANCE SHEET AS ON 31st MARCH, 2015

Corpus/ Capital Fund and Liabilities

(Amount in Rs)

Sl. No.	Sub head	Schedule	Current Year	Previous Year
1.	Capital Fund	1	190675044	179034291
2.	Reserves	2	0	16564192
3.	Earmarked/ Endowment Fund	3	0	3036551
4.	Current Liabilities & Provisions	4	23144068	19695839
	Total (1 to 4)		213819112	218330873
Assets				
5.	Fixed Assets	5	190182645	193462458
6.	Investments – Earmarked Endowment Funds	6	0	0
7.	Current Assets, Loans & Advances	7	23636467	24868415
	Total (5 to 7)		213819112	218330873
8.	Significant Accounting Policies	22	0	0
9.	Contingent liabilities & Notes to Accounts	23	0	0

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2015

(Amount in Rupees)

A. Income	Schedule	Current Year	Previous Year
Income from Sales/Service	8	1220409	1631947
Grants in aid/subsidies	9	149134256	156769043
Fees/Subscriptions	10	0	0
Income from Investments	11	0	0
Income from Royalty, Publications	12	0	0
Interest earned	13	264171	674235
Other Income	14	1709431	1504908
Prior Period Income	15	0	0
Total (A)		**152328267**	**160580133**
B. Expenditure			
Establishment expenses	16	114485433	121596783
Research & Operational Expenses	17	5957368	8819111
Administrative expenses	18	22828370	26912216
Grants and subsidies	19	0	0
Miscellaneous expenses	20	5959993	4715752
Depreciation	5	9317367	8251126
Prior period expenditure	21	0	0
Total (B)		**158548531**	**170294988**
Balance being surplus/(Deficit) carried to corpus/Capital Fund		**(-)6220264**	**(-)9714855**

RESOURCE GENERATION / CONSULTANCY

1.	Sale of institute produce	275382
2.	License fee	43568
3.	Interest earned on loans & advances	366216
4.	Analytical and testing fee	349200
5.	Application fee from candidates	28200
6.	Receipts from services rendered	367027
7.	Interest earned on short term deposits	44673
8.	Income generated from internal resource generation schemes	
	a) Training	90600
	b) Consultancy	110000
9.	Recoveries of loans & advances	1279278
10.	Miscellaneous receipts	594174
11.	Revenue receipts of NAIP	1071689.
	TOTAL (Rs)	**46,20,007**

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