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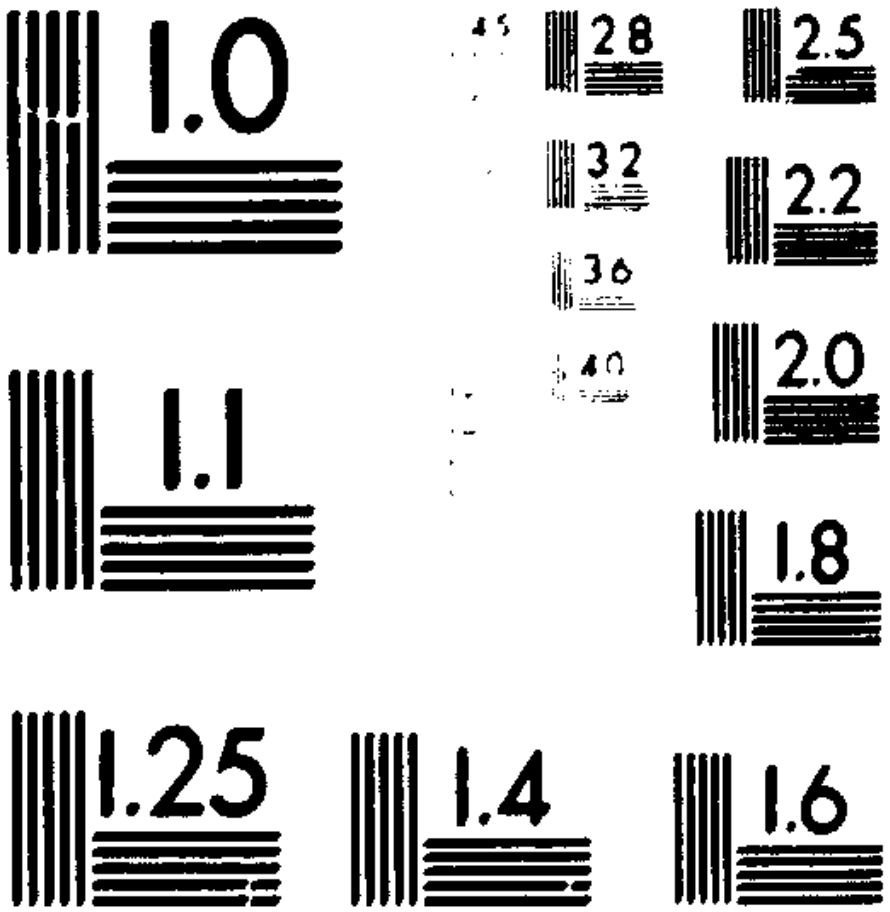

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JUTE PRODUCTS RESEARCH

DP/BGD/75/013

BANGLADESH.

Technical report: Assistance to B.J.R.I. - Technological Research Wing - on chemical finishing of jute and jute products*.

Prepared for the Government of Bangladesh
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Danuta ZYZKA
Consultant on Dyeing and Finishing of Jute and Jute Products

United Nations Industrial Development Organization
Vienna

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Abstract

Project: Assistance to the Bangladesh Jute Research Institute, Technology Research Wing, BGD/75/013/11-52
Chemical Finishing of Jute and Jute Products

This Technical Report is based on the 16 days work of the Consultant in chemical finishing of jute and jute products in the Bangladesh Jute Research Institute, Technological Research Wing at Dhaka since 6 May 1985 till 21 May 1985 (Fourth Return Visit)

The Consultant has evaluated the activities of the Institute's chemical laboratories and Pilot Plant facilities for the year 1984/85 and worked with the counterpart on improving and developing processes for bleaching, dyeing, printing and finishing of jute and jute products.

The report contains expert's findings and recommendations to the Bangladesh Jute Research Institute, Technology Research Wing.

The suggestions related to the technological research programme in the field of chemical finishing of jute products, are enclosed.

Acknowledgement

During her stay in Dhaka the Consultant was attached to the BJRI-TRW and worked in close contact with counterpart Mr. M.A. Salam, Chief, Technology Division, BJRI-TRW.

She was supported by Dr. A.M. Bhuiyan, Director, BJRI-TRW and by Mr. Comrade I. Diala, Project Administrator and also by Mr. Vicente C. Lavides, SIDFA, UNIDO, Dhaka.

The Consultant wishes to thank all the above mentioned people and all staff at BJRI-TRW for their co-operation, friendliness and warm hospitality.

Explanatory Notes

BJRI	-	Bangladesh Jute Research Institute
BJRI (TRW)	-	Bangladesh Jute Research Institute (Technological Research Wing)
UNIDO	-	United Nations Industrial Development Organisation
BJMC	-	Bangladesh Jute Mills Corporation
DF	-	Dyeing and Finishing Department
TC	-	Technical Chemistry Department
C	-	Chemistry Department
PP	-	Pilot Plant Department

CONTENTS

1. Introduction

This project of the Technological Research Wing of the Bangladesh Jute Research Institute, which comes within the United Nations Development Programme for Bangladesh, has the aim of providing assistance to develop the capability of BJRI for technological research and development work related to the products of the jute manufacturing industry. The Consultant's part of the project is in the field of chemical pretreatment, bleaching, dyeing, printing and finishing of jute and jute products.

Bangladesh is one of the best producers of jute in the world and meets around 60% of world jute requirement. About 62% of the countries foreign exchange is earned by exporting jute and jute goods.

In view of the increasing competition from synthetics, the existence of the jute industry will depend on the increase of its productivity and the development through research, of better products and new end-uses. The chemical finishing of jute goods based on the latest technologies, is a valuable factor in the improvement of jute yarns and fabrics for both the local and the international market.

The idea to use jute blends with synthetic fibres enlarges the requirements for new (for jute mill practice) finishing technologies.

This Technical Report should be regarded in conjunction with the previous ones, dated: February 1982, December 1982 and March 1984 respectively. The present report describes the status of the project in the field of chemical finishing of jute and jute goods in 1984/85.

2. Findings related to the Chemical Finishing of Textiles in BJRI-TRW in 1984/85.

In 1984 a new Dyeing Laboratory under the management of Mr. M.A. Salam and Dr. A.B.M. Abdullah has been organised. It is equipped with the basic laboratory items but in order to carry out the research work in a more sophisticated manner

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some other items are recommended. They are as follows:

- Shearing Viscometer
- Leucometer
- Traveling microscope for measuring contact angle for determining the surface free energy
- Tensile strength meter for yarn and fabric
- Reflectance Spectrophotometer for colour measurement and matching, which needs air-conditioned room.
- Bursting strength measuring equipment, which also needs air-conditioned room.

It would be also useful to have one Xenotest instrument under operation in this laboratory. The existing Xenotest instrument requires repair.

2.1. Laboratory and Trial Production Facilities

In the Pilot Plant Department in 1984 the Fabric Mercerizing Machine (Wakayamaya Ltd.) has been installed. From the mechanical point of view it is under operation but in addition to that some containers are needed. These locally made containers will be delivered in a short time.

The Wakayamaya's Mercerizing Machine is a slack chainless machine. The material upto 56" width could be processed. This machine represents rather a smaller item in comparison with the big mercerizing machines destinated for cotton. However, the capacity of the machine it sufficient for the BJRI-TRW research work purposes.

Although actually the decision to procure and install the Shearing and Singeing Machines as well as the Flat Screen Machine and a Steamer has been postponed it would be advisable to have such machines in BJRI for the future.

According to Consultant's previous Technical Report a "Rolling-device" for the "Pad-Roll" method applicable for some kinds of desizing, bleaching, dyeing and resin finishing processes should be put into mechanical operation and located in a heated chamber. Till now no progress has been made in this field. Also

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new screens for printing technologies have not been provided.

According to Consultant's observations in 1985 the utilization of the machines, actually existing in PP Department (Jigger, Padding mangle, Stenter, Calender) in comparison to the previous years is rather poor.

A great deal of chemicals, dyestuffs and auxiliaries necessary for chemical finishing of jute goods must be imported from the developed countries. The local production in this field is still very poor.

2.2 Activities in the field of chemical pretreatment, bleaching, dyeing, printing and finishing

In Consultant's previous Technical Reports the research projects of Dyeing and Finishing, Technical Chemistry and Pilot Plant Departments have been discussed in details. Many of them are the long-term projects (see the Work Programme for 1985) thus in this report only the main fields of activities have been stressed.

The Technical Work Programme of BJRI-TRW for the year 1985, which reflects the Institute's activity is as follows:

Work Programme for the year 1985

In the field of chemical finishing the following objectives are included into the Technical Research Programme:

Objective No. 5: To develop methods of dyeing/printing of jute products.

This objective is divided into five projects.

DF Development of pretreatment methods for jute products.

a. Desizing and scouring of jute materials including union and blended products.

b. Oxidising and reducing methods of bleaching of jute materials including union and blended products.

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c. Studies on the fastness properties and development of standards for jute

d. To measure colour change, due to light according to international scale and suggest standard for jute.

DF Development of dyeing methods with colouring matters of indigenous resources.

a. Procurement of indigenous colour matters

b. Dyeing of jute with the colouring matters

c. Analysis of the dyes and products.

DF Development of dyes and chemical for jute and allied fibre products

a. Preparation of new dyes for jute

b. Modification of existing dyes.

DF Development of printing methods with different classes dyes for jute fabrics.

a. Studies on the printing properties of different classes of dyes and establishing standard and economic printing methods.

b. Studies on the fastness properties of the prints.

Objective No. 6: To change the chemical and physical characteristics of jute by chemical means.

This objective is divided into three projects. One of them is connected with chemical finishing i.e.

PP Effect on alkali on jute materials.

Objective No. 7: To improve the market potential of jute products.

11 projects belong to this objective. Six of them are connected with chemical finishing. They are:

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DF, TC Photochemical studies of colour change of jute material and prevention of yellowing.

TC Improvement of resilience of jute carpet by chemical means.

PP Use of jute as reinforced plastic materials.

DF Findout standard washing and drying methods for jute products.

DF Studies on dermatological effect of new jute products.

DF Development of finishing/proofing process for jute products.

a. Studies on the possible uses of textile finishing materials in jute products for specific end uses.

b. Development of fire retardant process.

Objective No. 8: Trial products market evaluation and technical services

The chemical processing including scouring, woollenisation, bleaching, dyeing, printing and finishing of jute fibres, yarns and fabrics (both all jute and blends with other fibres) as well as the dyeing tests and analysis of dyes are involved.

Objective No. 9: Miscellaneous

The process for production of branding ink is included.

3. Consultant's activities

According to the UNIDO job description DP/BGD/75/013/11-52/31.7.B (return mission) jute consultant on dyeing and finishing of jute and jute products, attached to the Bangladesh Jute Research Institute (Technological Research Wing) at Dhaka was expected to work with the counterpart personnel on the improvement and development of processes of bleaching, dyeing, printing and finishing of jute and jute products.

3.1 Comments on the Technological Research Work for 1984 and 1985 in the field of chemical finishing of jute and jute products.

Special emphasis has been given to the Dyeing and Finishing, Technical Chemistry

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and Pilot Plant Departments regarding their range of research work and their facilities.

Because of the shortage of time (11 days stay in Dhaka) the Consultant made the general survey of the Institute's activities in the main fields of chemical finishing, followed by discussions on selected topics.

As a whole the progress on research in the field of chemical finishing of jute and jute products is going on according to programme. Here, the great contribution of Mr. M.A. Salam, Chief of Technology Division is to be emphasised.

Comparing the results achieved in various fields of finishing it is evident that in 1984/85 the attention has been paid especially to dyeing and end-finishing. This fact is undoubtedly connected with the return from abread of Dr. A.B.M. Abdullah. His Ph.D. work made at the UMIST in the United Kingdom was connected with the mechanism of yellowing process of jute. He had tried various stabilizers and found certain excited state quenchers which have outstanding property for stabilizing jute. In further exploration of this method he discovered a range of highly photostable dyes for jute. At present he dyed in BJRI about 100 yards jute fabric with one of the photo-stable dyes, based on nickel compounds. It is realy a break-through in jute dyeing, as it fulfilled the need of light fast dyes which can be used for wall-covering, furnish cloth and similar fields, where light fastness is highly needed. Further research work in this field on a pilot plant scale is strongly recommended.

Irrespective of the metal complex dyeing some other kinds of dyestuffs have been actually proved. They are: selected direct, basic, reactive and azoic dyes. Some sulphur dyes has been previously tried on a pilot plant scale. Also an interesting project "Dyeing with indigenous colour matters" is included into the work programme for 1985. For the proper work of the Dyeing Laboratory a Colour Atlas is needed.

For modern finishing of jute goods some resin precondensates are required. The very important long term project "To develop suitable resin precondensate

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for jute materials" has been completed. This work will be submitted to the University of Dhaka in form of a dissertation paper for Ph.D. of Mr. Nurul Amin from the the Chemistry Department. Because of promising results on jute goods by using the urea- and melamine precondensates the process appears to have commercial possibilities and undoubtedly will be able to improve the quality of jute goods by means of locally made chemicals. An interesting project is also going on concerning with durable (wash fast) fire retardant process for jute products.

In order to improve the resiliency of jute carpet by chemical means the treatment with epichlorohydrin vapour on the alkali treated, scoured and bleached jute fabrics has been proved. The crease recovery angles and the loss of tensile strength parameters have been measured. In consultant's opinion it would be advisable to carry out some more experiments with reactant type chemicals based on cycloethylene and cyclopropylene-urea.

In PP Department a great amount of all jute and jute cotton union fabrics have been processed (bleached, woollenised, dyed/printed and finished).

Some samples of jute/polyester and jute/acrilic blended yarns and fabrics have also been dyed and finished.

3.2 Consultations

The direct consultations and advices were given by the consultant to the research workers in BJRI-TRW. Importance had been given to the following subjects:

- The role of fibre constituents in photo-yellowing of jute and its prevention (possible topic for Ph.D.)
- The photostable dyes
- Dyeing with selected basic dyes
- One-bath dyeing with azoic combinations

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- Studies on dermatological effect of textile products.
- Fire-retardant finishing of jute goods
- The production of branding ink
- The resiliency of jute carpet.

Special emphasis has been given to the dissertation work for Ph.D. prepared at BJRI for the University of Dhaka by Mr. Nurul Amin from the Chemistry Department. The consultant's comments on this work titled: " Chemical modification of jute fabrics by cross-linking reactions" have been directly discussed in details with Prof. A. Jabbar Mian and the Author of the work.

4. Conclusion and Recommendations

4.1 Summary

The Bangladesh Jute Research Institute (Technological Research Wing) at Dhaka acting as the Government Institute is now in a good position to undertake research and development work in jute materials on a large scale. The need for the development of new jute products based on the new technologies can be realised on a pilot plant scale in the field of chemical pre-treatment, bleaching, dyeing, printing and finishing.

In summary it can be said that the current research programme at BJRI-TRW in the field of chemical finishing of jute and jute products is reflecting a trend toward practical orientation and industry utilization of results. However slowly, the progress on research in this field is going on accordingly.

4.2 Recommendations

Regarding the actual status of BJRI-TRW in the field of chemical finishing of jute and jute goods, in order to achieve the best results in fundamental and applied research work the consultant suggests following recommendations:

Research work organisation

1. In respect to better consolidation of efforts it would be advisable to

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determine the time limit for solution of individual projects. Many of them last too long.

2. The team of research workers from different Departments, groupped according to specified objectives, should continue the meetings at least every 2 months to discuss the progress and difficulties (if any) encountered in the research work.

3. The research findings should be utilised in the relevant industries.

4. It is still necessary to continue to demonstrate the chemical technology processes to the jute industry and to conduct some training courses for the mill personnel.

5. It is advisable to give preference in the Annual Research Programme to projects ordered or constructed by private or government jute mills.

6. The direct visits to factories paid by the team of BJRI-TRW senior research workers together with the UNIDO/UNDP consultants, appeared to be very useful for the better collaboration between the Institute and the Jute and Textile Industries.

Research Projects

1. In the Work Programme for the year 1985 an important change in the field of chemical finishing is to be emphasized. Due to the experiments made in Spinning and Weaving Departments connected with blended jute goods with man-made, especially synthetic fibres the elaboration of new methods of their finishing is needed.

2. To the most important processes, which need special care belong:

   - the methods for prevention of yellowing of natural and bleached jute
   - development of photostable dyes for jute (with regard to the PP production scale)
   - development of dyeing methods for union and blended products
   - development of printing methods

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- the improvement of resilience of jute carpet by chemical means
- development of fire retardant process.

3. More attention should be paid to the publications in the Bangladesh Journal of Jute Fibre Research.

4. In many cases it would be advisable to present the results of research investigations in graphs instead of long tables.

Equipment

1. To carry out the research work more intensively and in a more sophisticated manner it would be advisable to equip the new organized Dyeing Laboratory with a Reflectance Spectrophotometer and a Bursting Strength Measuring Equipment, which need the airconditioned room. Also tensile strength meter for yarn and fabric, a leucometer, Shearing Viscometer and a Special Microscope for determining the surface free energy would be useful. The already existing but not under operation Xenotest instrument requires quick repair.

2. For the next step of implementation of BJRI-TRW the procurement of a whole-width steamer, a singeing machine, a flat screen printing machine, a cylinder dryer and a Rolling-device for PP Department should be considered.

3. The actually existing machines like jigger, padding mangle, stenter, calender in PP Department should be utilized more intensively.

4. For the printing processes some new screens especially designed to the needs of both internal and external market are necessary.

5. To keep the jute textile production on an international level it is still necessary to enlarge the range of applied modern dyestuffs and auxiliaries.

6. In respect of the possibility to use the blends of jute with synthetic fibres for garments and other new end-uses it is recommended to supply the DF and PP Department with disperse dyes (to use along with other kinds of dyestuffs suitable for jute).

Annex I

Consultant's Work Programme

6 May, 1985	- Departure from Poland and entry to duty
7 May, 1985	- Briefing in Vienna
8 May, 1985	- Departure from Vienna to Dhaka
9 May, 1985	- Arrival in Dhaka
9-20 May, 1985	- Review of the Dyeing and Finishing, Technical Chemistry and Pilot Plant Departments activities
	- Visit to the University of Dhaka, Chemistry Department
	- Consultations with BJRI (TRW) Staff members.
20 May, 1985	- Departure from Dhaka to Vienna
21 May, 1985	- Arrival in Vienna
22 May, 1985	- Debriefing in Vienna
23 May, 1985	- Completion of assignment