



# CIRCOT *n ear*

Newsletter of the Central Institute for Research on Cotton Technology, Mumbai

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## Contamination Cotton

Contaminants which are man-contributed impurities in cotton constitute the biggest problem faced by the spinners while processing Indian cottons. Besides causing damage to spinning and preparatory machines contaminants will reduce yarn and fabric Quality. End breaks and machine stoppages can also increase considerably because of the presence of contaminants.

The International Textile Manufacturers' Federation (ITMF) conducts biennial surveys of cottons to keep a tag on the level of contamination worldwide. The survey based on thousands of samples from many countries classifies 16 contaminants comprising four types of fabrics, four types of strings, four types of oily substances, three types of inorganic matter and one group of organic substances. Information on sticky matter and seed coat fragments in lint is also separately collected in the ITMF survey.

The survey data of 1997 and 1999, when compared, reveal interesting information. It is clear that contamination is

on the increase in Indian cottons. While the 1997 survey showed only four varieties in the list of top ten **most contaminated** cottons, there are seven in the recent report. Varieties like F.414, H.4, LRA.5166 and S.4/S.6 have retained their dubious position in the list while DCH.32 and J.34 besides one group of unnamed varieties have made entry into the list. No variety from India has found its way into the top 29 **least contaminated** cottons.

The best way to tackle contamination is to prevent it from occurring — careful picking of cotton from the field, heaping cotton on paved surfaces, covering heaps with cloth, transporting seed cotton in a covered condition, careful handling at the market yard, minimising human handling at the ginnery and covering the bale as per Indian Standard specifications are essential requirements.

Contamination has been cited as one of the reasons for the avoidance of Indian cottons by many mills in India who have been importing cotton at a time when cotton is surplus. An early solution is needed for the contamination problem.

K.R. Krishna Iyer  
Editor

## 'on'ble Minister State for Agriculture Shri Hukumdeo Narayan Yadav visits CIRCOT

Honourable Minister of State for Agriculture Shri Hukumdeo Narayan Yadav visited CIRCOT, Mumbai on March 4, 2000 and expressed satisfaction at the way the Institute has progressed in terms of research and infrastructure. While speaking to the scientists, he stressed the need for a fusion between tradition and modernity in research and allied activities. Emphasising the need for preserving the environment and nature as a whole, the Minister called upon scientists to work for developing eco-friendly technologies in pest control and crop management. It should be our objective, the Minister said, to impart and increase natural vigour in plants by genetic means rather than by resorting to only hybridisation.



**Editorial committee :** Dr. K.R. Krishna Iyer, Dr. S. Sreenivasan, Dr. R.H. Balasubramanya  
Shri T.K.M. Das, Shri V.B. Suryanarayanan



*International Seminar on Cotton and its  
Utilisation in the 21st Century*

CIRCOT in collaboration with ISCI organised a three-day International Seminar on Cotton and its Utilisation in the 21st Century on December 10-12, 1999 at the Institute premises to commemorate the Platinum Jubilee of CIRCOT.

The inaugural session of the seminar was held on December 10, at 2.30 p.m. Dr. K.R. Krishna Iyer, Director welcomed the dignitaries and in his welcome address mentioned that the seminar intends to bring together experts in the field of cotton production, processing, marketing and by product utilisation on the one hand and the policy makers on the other on a common platform for an effective dialogue. The chief guest Dr. R.S. Paroda, Secretary, Department of Agricultural Research and Education (DARE) and Director General, ICAR brought to fore the fact that one does not need to be pessimistic about the cotton sector and pointed out that there is tremendous potential for cotton in the domestic and in international markets if new strategies are developed and the quality is improved. He exhorted the private sector and the industry to come forward to fulfil their social responsibility by taking new technologies to the field. Allaying fears that other fibres were causing a threat to cotton, Dr. Paroda observed that if precision farming, mechanised picking and better processing are taken up as a people's movement, there will definitely be a two-fold increase in the productivity of cotton. The white gold

has survived and will survive not only as a component of blends but also alone, he stressed.

Presiding over the inaugural session Shri B.C. Khatua, Textile Commissioner, Govt. of India expressed his reservation over the success of Mini mission II of Cotton Technology Mission (CTM) and called for stringent measures to amend the Essential Commodities Act and the Seed Act by introducing new regulations and rules to denotify poor quality seeds. He advocated the adoption of integrated pest management which would enhance the productivity. Shri Khatua also highlighted the future of cotton from the socio-economic point of view of our country and felt that if proper marketing strategies were evolved, export of cotton would get a tremendous boost. Shri Khatua added that the five member committee of scientists appointed by the Cotton Advisory Board (CAB) has undertaken a study of the 35 agro-climatic cotton growing zones in the country. The Ministry of Agriculture should make use of the finding of this study and promote R & D for maximizing the quality of existing varieties and filling up the gaps in the availability of cottons for use by the industry..

Present among the distinguished invitees who spoke during the session were Dr. Anwar Alam (DDG, Engg. ICAR), Dr. Mangala Rai (DDG, Crop Science, ICAR), Shri K.V.Iyer (Special Advisor and Ex.Vice Present Raymond Ltd.) Shri M.B.Lal (Advisor, CTM and Ex. CMD, CCI, Ltd.) Dr. M.S.Kairon (Director, CICR), and Shri G.K. Sundaram (CMD, Lakshmi Mills, Coimbatore).

The following books were released at the function. (i) *Handbook of Cotton in India*, (ii) *Souvenir*, (iii) *Book of Papers*, (iv) *Indian Cottons over the years—A Compendium of Technological properties* and (v) *CIRCOT—An Institute poised for the Twenty-First Century*, a brochure on CIRCOT.

Technical sessions were conducted on December 11 and 12, 1999. There were 11 technical sessions based on themes like Fibre Production—Cotton, Crop Protection, Fibre Production—Competing Fibres, Ginning, Fibre Quality Assessment, Marketing, Yarn production and Quality, Fabric Production and Quality, Textile Exports and Fashion, Chemical Finishing of Textiles and By-products Utilisation. In all 36 papers were presented. There were two poster sessions. Poster Session I dealt with Fibre Production, Ginning, Marketing, Yarn Production and Quality Assessment, while Poster Session II included Chemical Finishing of Textiles, Textile Exports and By-product Utilisation.



Dignitaries at the Inaugural Session (from P. to R) Dr. K.R.K. Iyer, Director, CIRCOT, Shri M.B. Lal, Advisor, CTM and Ex. CMD, CCI Ltd., Shri G.K. Sundaram, CMD, Lakshmi Mills, Coimbatore, Shri B.C. Khatua, Textile Commissioner, Dr. R.S. Paroda, Secretary, DARE Director-General, ICAR, Dr. Anwar Alam, DDG, Engg., ICAR and Dr. Mangala Rai, DDG, Crop Science, ICAR

On December 11, Shri Shyamal Ghosh, Secretary, Ministry of Textiles, Govt. of India, chaired Plenary Lectures session. There were two papers — one presented by Dr. Derek Russell, Natural Resources Institute, U.K., on *Sustainable cotton production with particular reference to pest Mmagement* and the other by B.C. Khatua, Textile Commissioner, Govt. of India on *Problems and prospects of Indian textile industry for the new millennium*.

CIRCOT availed of the opportunity to disseminate the research accomplishments on the platform provided by CIRCOT Stall at the Exhibition which was also organised during the Seminar. The live demonstration of the production of biogas from willow-dust and the Laboratory Model Gin, display of particle board and paper produced from cotton stalks, etc. impressed the viewers and attracted a lot of inquiries from entrepreneurs.

The Valedictory Session was chaired by Dr. R.P. Kachru A.D.G.(PE), ICAR. Dr. T.P.Rajendran, Sr. Scientist, CICR, Nagpur and Dr. P.V.Varadarajan, Sr. Scientist, CIRCOT summed up the proceedings of First day and Second day respectively before the panelists comprising Dr. V. Santhanam, Dr. T. Radhakrishnan, Prof. E.H. Daruwala, Dr. A.K.Basu, Dr. S.R. Ranganathan, Shri. M.B.Lal, Dr. V.R.Menon, Dr. K.R.K. Iyer and Dr. M.S.Kairon. The Chairman, the panelists and those present at the session deliberated over the various issues that

emerged from the papers presented during the seminar and the recommendations were sent to ICAR for follow up action.



Prof. C.D. Kane, Principal, DKTI Institute, Ichalkaranji speaking at the National Science Day meeting on February 28, 2000

### Lecture Series

Three lectures were arranged in collaboration with the Indian Fibre Society and one lecture was arranged as part of the celebration of the Golden Jubilee of the adoption of Hindi as national language. Details of the lectures are given below.

- (i) Shri Ahmed, Senior Scientist, CIRCOT delivered a lecture on *Quality Control in Cotton Knits* conducted on January 29, 2000.
- (ii) Prof. N.V. Bhat, Head, Physics Division, UDCT delivered a lecture on *Synthesis and Use of Conducting Fibres and Polymerson* February 17, 2000.
- (iii) Dr. G.S. Nadiger, Director, Textiles Committee Laboratory gave a lecture on *Bharat mein Resham Proudhyogiki ka Avalokan* on February 25, 2000
- (iv) Prof C.D.Kane, Principal, DKTE Institute, Ichalkaranji gave a talk on *Carpet Weaving and Designing of Carpet Winding/Unwinding Unit for Sultanate of Oman* on February 28, 2000 in connection with the National Science Day.



A section of the audience

## Institute

## Committee Meeting

The fiftieth meeting of the Management Committee of CIRCOT was held on February 29, 2000 at 11.00 a.m. in the Committee Room of the Institute.

After confirmation of the minutes of the last meeting and action taken on the recommendations of the last IMC, other agenda items such as expenditure under Plan and Non-Plan upto 31-01-2000, Progress of Works, Institute Joint Council and Grievance Cell representations, etc. were discussed. Research Highlights were presented by the HODs and the issue of sharing of profit from resource generation under Johl's Committee guidelines were discussed as a separate item. The proposal for writing off the Staff Car was also approved.

## Staff Research Council

The hundredth meeting of the Staff Research Council of CIRCOT was held at the Committee Room between March 21 and 24, 2000 as per details given below :

Dr. K.R. Krishna Iyer, Director was in the chair for all the sessions and Dr. V. Sundaram, Ex-Director, CIRCOT was the external subject specialist invited to attend all the sessions. While HODs and internal members of the Institute Managing Committee attended all the sessions, other Scientists of various disciplines attended only the sessions with which they were concerned. Besides reviewing the progress of Research the



Management Committee meeting in progress

SRC also considered six new project proposals. Programme of Work for the year 2000-01 was drawn up on the basis of the discussions.



Dr. K.R. Krishna Iyer, Director, CIRCOT attended the 58th Plenary Meeting of the International Cotton Advisory Council (ICAC) held at Charleston in South Carolina, USA from October 25 to 29, 1999. Dr. Iyer was the ICAR nominee in the four member official Indian Delegation to the ICAC Meeting. Besides participating as a member of the delegation in various plenary sessions, Dr. Iyer presented an invited paper on **What we do not know about fibre quality** at the one-day technical seminar which formed part of the ICAC Meeting.

## Best Article Contest

To commemorate the Diamond Jubilee of the Textile Association (India), the Journal of the Textile Association had announced an essay contest on the theme **Textiles at the Dawn of the 21st Century**. Individuals were expected to write articles on latest developments and future trends in various disciplines of textiles. Dr. S.K. Chattopadhyay and Shri N. Shanmugam of CIRCOT, Mumbai were winners of **Consolation Prize** for their article entitled **Latest Developments and Future Trends in Spinning**.

### *Seed Coat Fragments vs Lint during Ginning*

In a study at CIRCOT, seed coat fragments from chalazal cap showed higher lignin content as compared to those from the side and micropylar regions. Cells in the micropylar and chalazal regions are densely packed holding the fibre firmly to the seed surface. Cells in the side region are fully developed and widely spaced. In chalazal cap region, the spongy structure and the compact cell packing which hold the fibre base firmly appear to be the main reason for the removal of the chalazal cap along with fibres during ginning.

### *Natural*

In another study at CIRCOT Marigold flowers were used for imparting yellow colour to cotton fabrics with good colour fastness properties. Alum was used as mordant. Replacing alum with ferrous sulphate yielded yellowish black colour but with poor fastness to washing and alkaline perspiration. Dye uptake and colour strength of the fabric dyed with Manjit root extract (as measured by absorbance value) could be enhanced by using cellulase enzyme. Various conditions for enzyme treatment also were standardised. Use of pectinase and xylanase enzymes also had shown encouraging results for extraction of dyes. Conditions for the extraction and application of dye from aster and yellow chrysanthemum flowers were standardised. The dyed fabrics had only moderate fastness to washing, but had excellent fastness to light.

At CIRCOT enzyme treatments were tried on woven cotton fabrics to improve their aesthetic properties. The smoothness and softness properties of woven cotton fabrics were found to improve considerably on treatment with cellulase enzyme. Of the three enzyme concentrations tried, viz. 0.5%, 1% and 1.5% and reaction times of 45 min and 60 min, 1% enzyme concentration and 60 min reaction time were found to be optimum as they produced fabrics with the least losses in strength and elongation properties.

### *Finishing Treatments      Handle & we Comfort*

The influence of finishing treatments on handle and comfort properties of Denim fabrics was assessed at CIRCOT. It was observed that purification and finishing treatments successively lead to improvement in elastic properties in addition to imparting a softer and smoother feel thereby improving the

handle value. Although air permeability values were marginally decreased by finishing treatments, the wear comfort was not hampered as the treated fabrics could remove greater amounts of moisture by absorption.

### *Microspinning of Ramie-Cotton*

Five samples of degummed ramie fibre received from NIRJAFT were cut into 40 mm staple and blended with MCU.5 cotton at the mixing stage for microspinning trials at CIRCOT. Optimisation trials confirmed that 35% of ramie fibres could be blended with cotton for the production of 40s ramie-cotton blended yarns maintaining a stable spinning condition.

### *Estimation of Fibre Maturity from Micronaire*

CIRCOT studies have confirmed that for a given variety of cotton, the cross sectional perimeter remains constant and that there exists an excellent relationship between Micronaire Value and the degree of thickening which is a measure of maturity. Calibration graphs representing the relationship between Micronaire value and the degree of thickening have been constructed for five varieties of cotton. With the aid of this calibration graph, pertaining to each variety, the fibre maturity of an unknown sample can be estimated by conducting a simple Micronaire test.

### *National Accreditation Board*

for

*Weighting and Calibration Laboratories*

**NABL**



NABL **I** 179

Date **02** 2000

This is to certify that Central Institute for Reseed, on cotton, Technology, Mumbai has been accredited on the basis of its compliance to NAM - Criteria which are based on **ISO/IEC** Guide 25 & EN-45001 in Chemical testing discipline.

This accreditation is valid for a period of three years from the date of issue for testing capabilities as specified in **annexure** (s) to this Certificate.

Director  
NABI.

Chairman  
NABI, India

### Transfer of Technology

Varinder Agro Industries Ltd. manufacturers of writing grade paper from wheat straw had approached CIRCOT for conducting a trial of the bio-pulping technology developed by this Institute. As per their request, a 4 tonne trial was undertaken in one of the digesters at the mill premises for a demonstration of the technical feasibility of the technology. For scale up trials a detailed plan was chalked out for processing 10 tonnes of material. Drawings relating to the design of a new plant have been sent to the mill for consideration.

RI CIRCOT Calibration Cottons meant for calibrating fibre testing instruments were sold to the extent of about 300 containers. Feedback from the users has been quite encouraging. Leaflets on CIRCOT Calibration Cotton were prepared and widely distributed.

☑ The period of licence for the manufacture of CLOY Gin granted to Precision Tooling Engineers, Nagpur has been extended for a further period of 3 years.

instrument for determining the moisture content in cotton bales.

☑ Director, CIRCOT and Bajaj Steel Industries Ltd., Nagpur have signed an MOU for manufacturing and marketing of C I RCOT pre-cleaners.

MOU for manufacturing and marketing of Lilliput Gin has been signed with Precision Tooling Engineers, Nagpur.

### Training and Extension

Given below are details of training imparted to sponsored personnel during the year :

1	Training in ginning	226 trainees in 15 batches
2	Training in cotton	56 trainees in 7 batches
3	Specialised training course in HVI & AFIS	11 trainees in 2 batches

### Commercial Testing

CIRCOT received nearly 10,000 samples of fibre, yarn and fabric for paid tests from textile mills, Government and semi Government Organisations. Besides routine commercial testing CIRCOT undertook special tests using sophisticated instruments such as SEM, XRFS etc. from the following organisations.

- Exon Laboratories, Malad, Mumbai
- Reliance Industries Ltd., Mumbai
- N.F. Enterprises, Mumbai
- Corochem, Mumbai
- Modern Petrofils, Mumbai.

### Consultancy

2 Ginni Filaments Ltd. at Chhata near Mathura approached CIRCOT for suggesting ways for disposal of cyclone-dust generated in their mill. CIRCOT has recommended that this waste could be used for the production of biogas. Accordingly drawings have been prepared and sent to the company. The proposal is under consideration.

EI An MOU has been signed with Mecord Systems and Services Pvt., Ltd. for the development of an electronic

### Accreditation

CIRCOT has received certificate of accreditation from the National Accreditation Board for Testing and Calibration Laboratories (NABL) on the basis of an on-site assessment of the quality system established at CIRCOT.

### Exhibitions

CIRCOT participated in (i) the exhibition organised as part of the International Seminar on Cotton and its Utilisation in the 21st Century at CIRCOT between December 10-12, 1999 and (ii) Krishi Expo exhibition held at Pragati Maidan, New Delhi between January 26, 2000 and February 2, 2000.

Congratulations

Shri A.J. Shaikh, Sr. Scientist was awarded Doctoral Degree in Microbiology by the University of Mumbai on 30-03-2000.



Dr. R.S. Panda, D.G., ICAR at the CIRCOT Stall at Krishi Expo Exhibition

<i>Personnel</i>		
Name	Post	Effective Date of Appointment/ Promotion
<b>Appointments</b>		
Shri Sujit Kumar Shukla	Scientist	15-11-1999
Kum. Jyoti Sharma	Scientist	18-11-1999
Dr. (Smt.) Niveta Jain	Scientist	24-11-1999
Shri K. Ramanarayanan	Technical Assistant T-4	21-10-1999
Shri Chandankumar Kutti	Sr. Research Fellow	21-10-1999
Shri B.L. Lalan	Sr. Research Fellow	17-12-1999
Kum. Bindubala Singhvi	Research Associate	21-10-1999
Smt. M.P. Kamble	Technician T-1	16-10-1999
Shri S.V. Kasabe	Jr. Accounts Officer	22-11-1999
Shri D.K. Kasar	Supporting Staff Grade I	01-10-1999
Shri S.R. Tondse	Supporting Staff Grade I	01-10-1999
Shri D.R. Gawde	Supporting Staff Grade I	05-10-1999
Shri S.S. Surkule	Supporting Staff Grade I	05-10-1999
Shri A.N. Jadhav	Supporting Staff Grade I	05-10-1999
Smt. V.N. Walzade	Supporting Staff Grade I (Compassionate Grounds)	04-03-2000
Shri S.M. Chandanshive	Supporting Staff Grade I (Watchman)	21-03-2000
<b>Promotions</b>		
Dr. L.D. Deshmukh	Scientist (Sr. Scale) to Senior Scientist	19-12-1998
Shri G.S. Patel	Scientist (Sr. Scale) to Scientist (Selection Grade)	01-07-1999
Shri Y. Subrahmanyam	Scientist (Sr. Scale) to Scientist (Selection Grade)	01-07-1999
<b>Retirement</b>		
Shri C.R.S. Moni Iyer	Technical Officer T-6 (Retired Voluntarily)	19-02-2000 (FN)
<b>Transfer</b>		
Shri P.S. Anilkumar Sr. Technical Asstt.	CIRCOT QE Unit, Indore to CIRCOT QE Unit, Guntur	21-10-1999
Dr. L.D. Deshmukh Scientist (S.G.)	CIRCOT QE Unit, Nanded to Headquarters, Mumbai	19-11-1999
<b>Obituary</b>		
Dr. L.D. Deshmukh,	Sr. Scientist	Expired on 03-03-2000
<i>Training Programmes Attended 4 Staff</i>		
Training Programme	Period and Place	Participant(s)
Advanced Training in Scanning Electron Microscopy	14-11-1999 to 21-11-1999 at Philips Electron Opticals, Eindhoven, Netherlands	Shri D. Radhakrishnamurthy, Shri G.B. hadge
69th Foundation Course for Agricultural Research Service	Four months starting from 06-01-2000 at NAARM, Hyderabad	Shri S.K. Shukla, Kum. Jyoti R. Sharma Dr. (Smt.) Niveta Jain
First Interactive Workshop on O & M Reforms for Administrative & Finance Officers of ICAR and Brainstorming Session on Betterment of Institutional Management through Sensitisation and Orientation	13-02-2000 to 17-02-2000 at NAARM, Hyderabad	Shri N.N. Lotha
Advanced Training in HPTLC	27-02-2000 to 03-03-2000 at M/s CAMAG, Switzerland	Dr. P.V. Varadarajan Dr. A.J. Shaikh

<i>Articles Published</i>		
<b>Authors</b>	<b>Title</b>	<b>Journal</b>
Gangar, H.U, Mantha, S.S., Balasubramanya, R.H.	<i>Commercial Plants for Biogas Production from Textile Mill Wastes</i>	Textile Industry and Trade Journal, Vol.37, No. 11-12, p.64, Nov.- Dec., 1999
Laxmivenkatesh, H.R.	<i>Compact Spinning - The Technology of Future</i>	Textile Industry and Trade Journal, Vol.37, No. 11-12, p.83, Nov.- Dec., 1999
Sreenivasamurthy, H.V. Shanmugam, N.	<i>Selection of Raw Material and Process Parameters for Rotor Spinning of Fine Counts</i>	Journal of the Textile Association, Vol.60, No.5, p.227, Jan.-Feb., 2000
Chhagani, R.R., Iyer, V., Shenai, V.A.	<i>Modifying Cotton for Dyeing</i>	Colourage Journal, Vol.XLVII, No.2, p.27, February, 2000
<i>Other Publications</i>		
	<ol style="list-style-type: none"> <li>1. CIRCOT Leaflet No. 14 — <i>Lilliput Gin-The Small Portable Gin of CIRCOT</i></li> <li>2. CIRCOT Leaflet No. 15 — <i>Production of Biogas from Textile Mill Wastes</i></li> <li>3. <i>Schedule of Test Fees</i></li> <li>4. Book on <i>Indian Cottons Over the Years - A Compendium of Technological Properties</i></li> <li>5. Book of papers of the <i>International Seminar on Cotton and its Utilisation during 21st Century</i></li> <li>6. Brochure — <i>CIRCOT - An Institute Poised for the Twenty-First Century</i></li> <li>7. <i>CIRCOT News Letter April 1999 - September 1999</i></li> </ol>	
<i>Papers Presented at Seminars/Conferences</i>		
<b>Authors</b>	<b>Title</b>	<b>Seminar/Conference</b>
Ashtaputre, N., Balasubramanya, R.H.	<i>GA Novel Inexpensive Technique for Isolation of Anaerobic Micro organisms</i>	40th <b>Annual Conference of the Association of Microbiologists of India</b> , November 29 to December 1, 1999, Bhubaneswar
Bhatawdekar, S.P., Kathe, A.A., Gayal, S.G.	<i>Production of Cellulase by Solid State Fermentation</i>	40th <b>Annual Conference of the Association of Microbiologists of India</b> , November 29 to December 1, 1999, Bhubaneswar
Harish Mulchandani, Ahmed, M.	<i>All about Knits</i>	International Seminar on <b>Cotton &amp; its Utilisation in the 21st Century</b> , December 10-12, 1999, Mumbai
Vizia, N.C., Krishna Iyer, K.R.	<i>Ginning Research in India - Future Prospects</i>	International Seminar on <b>Cotton &amp; its Utilisation in the 21st Century</b> , December 10-12, 1999, Mumbai
Balasubramanya, R.H., Shaikh, A.J.	<i>Value Addition to Cotton Plant Byproducts — Research at CIRCOT</i>	International Seminar on <b>Cotton &amp; its Utilisation in the 21st Century</b> , December 10-12, 1999, Mumbai
Bhama Iyer, P., Janaki K. Iyer	<i>Application of HVI and AFIS to Indian Cottons</i>	International Seminar on <b>Cotton &amp; its Utilisation in the 21st Century</b> , December 10-12, 1999, Mumbai
Murugesan, R., Tajuddin, A.	<i>Battery Powered Sweep for Weeding and Interculture</i>	34th <b>Annual Convention of ISAE</b> , December 16-18, 1999, HAU, Hisar
Saxena, S., Iyer, V., Shaikh, A.J., Chhagani, R.R.	<i>Dyeing of Cotton with the Natural Dye - Berberine</i>	All India Seminar on <b>Wet Processing and Finishing Techniques in Textiles for 21st Century</b> , January 15-16, 2000, Davangere
Krishna Iyer, K.R.	<i>Challenges to Cotton from Other Fibres in the Next Decade</i>	National Seminar on Strategy for Increasing <b>Cotton Production and Productivity in 21st Century</b> , January 20-22, 2000, Nagpur