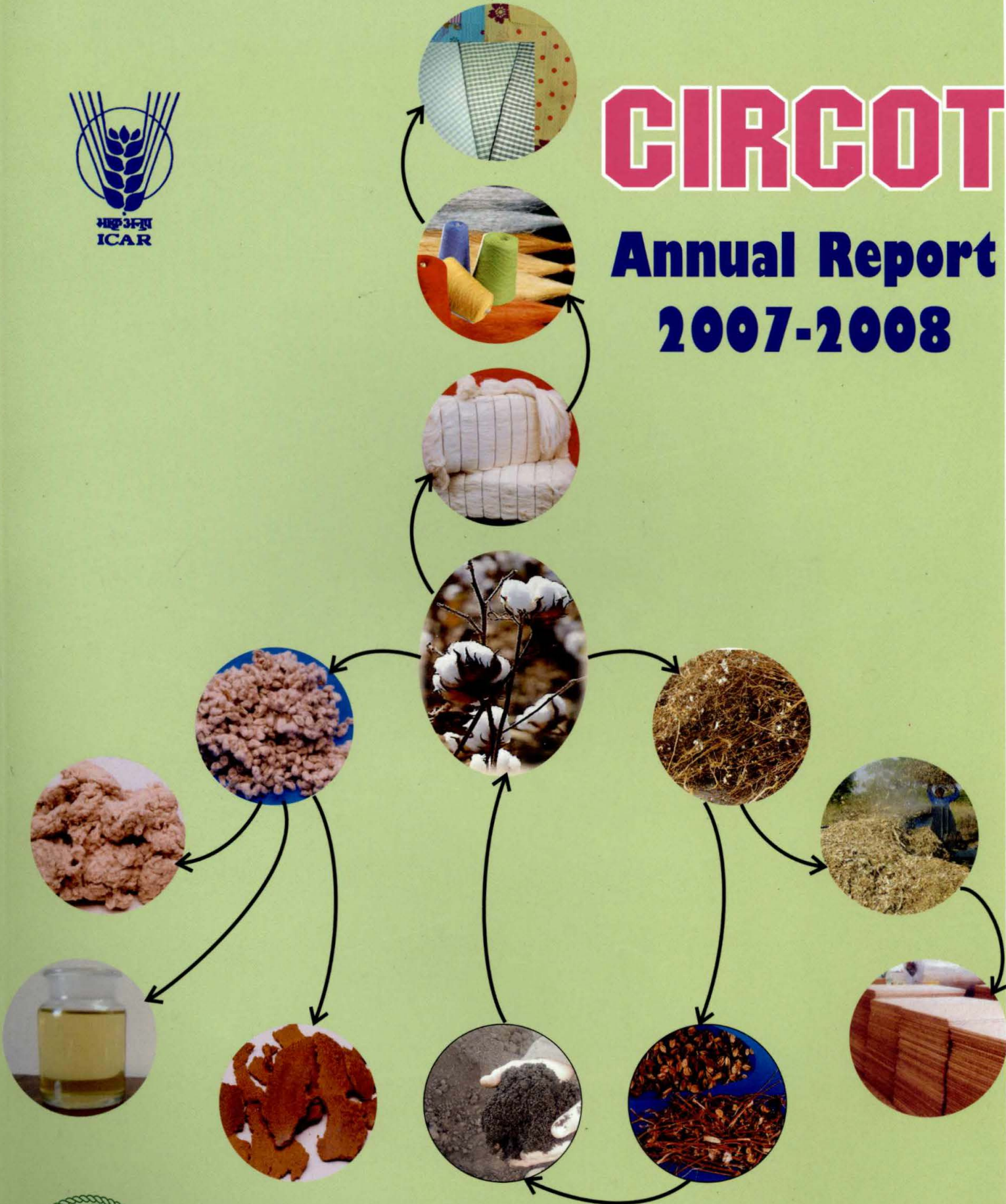




# CIRCOT

## Annual Report 2007-2008



**CENTRAL INSTITUTE FOR RESEARCH ON COTTON TECHNOLOGY**  
(Indian Council of Agricultural Research)  
Adenwala Road, Matunga, Mumbai-400019

# **CIRCOT**

## **ANNUAL REPORT**

### **2007-2008**



**Central Institute for Research on Cotton Technology**

(Indian Council of Agricultural Research)

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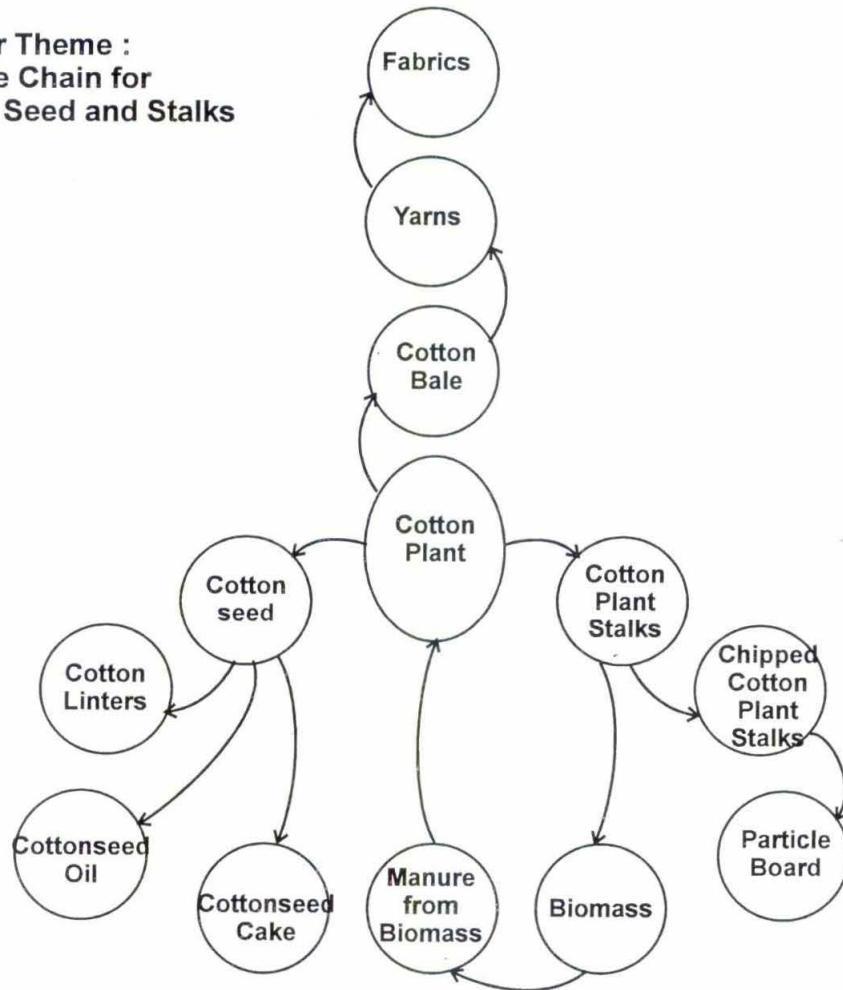
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Cotton fibre, Seed and Stalks**



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## Preface

*The eighty-fourth annual report of CIRCOT for the year 2007-08 being presented here highlights the accomplishments of the Institute in its various facets of activity spanning research, technology transfer; commercialization, consultancy and contract research, training and education.*

*India has surpassed USA in cotton production and has gained the second place after China. Cultivated in an area of 95.55 lakh hectares, a bumper crop of 315 lakh bales is estimated to be the production for the cotton year 2007-08 with an average productivity of 560 kg/ha. This phenomenal achievement has a sizable contribution from Gujarat and Andhra Pradesh where the productivity has touched an all time record of 750 kg/ha. A favourable combination of an all-round awareness about productivity and quality in the cotton value chain, good monsoon, good quality inputs including seeds; large scale adoption of IPM; IRM; INM etc; modern processing facilities to provide contaminant – free clean cotton bales and to top it all favourable Governmental policy initiatives have all contributed to the resounding growth in the sector.*

*Bt cotton has occupied about 66% of the area in the country. The indications are that in the crop season 2008-09; the coverage could reach upto 85%. Barring the problem of minor pests taking the shape of a major menace; the productivity boost achieved has a lot to do with the Bt cotton. However, the fibre quality profile of the Bt hybrids released in the country for cultivation has left a lot to be desired. The fibre attributes of Indian cotton has not received any major gain though the cleanliness has shown a*

*significant improvement in recent years. To sustain the momentum achieved in cotton production and processing; it is necessary to maintain a tempo of acceleration in cotton consumption, diversification and value addition. Institutes like CIRCOT have a role cut out under the circumstances.*

*The CFC funded project on “**Utilisation of Cotton By-produce for Value Added Products**” executed by CIRCOT has been progressing well. The mid term review conducted by the team appointed by the funding agency has noted the progress of the project to be satisfactory. Based on their suggestions, the Institute had approached CFC for an extension of the project for one more year upto the end of 2009. It is proposed to conduct a market survey afresh to gauge the demand for particle boards from cotton stalks so as to help in entrepreneurship development in rural areas growing cotton. Excise duty normalization and even bring down the rate of duty in comparison to that imposed for wood boards are steps urgently needed to give a boost to the production of boards from agro- residues like cotton stalks. Governmental intervention in this area is urgently needed.*

*It is heartening to note here that the National Agricultural Innovation Project (NAIP), a world bank funded initiative by ICAR; has accepted the project submitted by CIRCOT on ‘**A Value Chain for Cotton Fibre, Seed and Stalks: An Innovation for Higher Economic Returns to Farmers and Allied Stakeholders**’. This project with partners as CICR, Nagpur and M/s. Superspinning Mills, Coimbatore envisages gainful utilization of fibre, seed and its value*

added byproducts and stalks with appropriate value addition not only for the benefit of all the stake holders in the value chain but also as a means to provide higher income to cotton growers. CIRCOT has also been the beneficiary as a leader for another initiative under NAIP: Component 4 for a project on **'Synthesis and Characterisation of Nano-Cellulose and its Application in Biodegradable Polymer Composites to Enhance their Performance.**

'This collaborative project with Mumbai University Institute of Chemical Technology (MUICT) as partner aims to work on this emerging area to produce biodegradable nano-cellulose impregnated polymers that would find potential applications in agriculture.

During the course of the year, CIRCOT has also bagged two more projects, one each under Component 2 and 4 as partner institution based on the subject matter specialization of the Institute. In a project entitled "**Design and Development of Rubber Dams for Water Sheds**" proposed by the Indian Rubber Manufacturers Research Association, Thane under component 4; CIRCOT has been identified as a partner along with M/s. Kusumgar Corporates, Mumbai and Water Technology Centre for Eastern Region, Bhubaneshwar. This project envisions development of a prototype rubber dam to be used as water shed. CIRCOT would have the role along with M/s. Kusumgar Corporates to develop appropriate base fabric that could be converted into a rubberised dam to be used as a water shed device. In yet another project on **A value chain on utilization of Banana Pseudostem for Fibre and other Value Added Products** proposed by Navsari Agricultural University; CIRCOT has been given the role of finding out appropriate utilization for banana fibre for preparation of yarns and other value added products as well as utilization of scutcher waste for paper making. All these initiatives, although go to show the recognition of strength of CIRCOT among peer groups, have

saddled the Institute with additional responsibilities in the wake of continuously depleting scientific human resource. However the scientific and technical staff of the Institute would like to shoulder these responsibilities with aplomb to justify the faith reposed in them.

Another welcome development during the year that would have far reaching impact is the acceptance of the new building proposal of CIRCOT at Matunga by the Heritage Committee of the Brihan Mumbai Municipal Corporation. Although the entire project is yet to go through the rigmarole of municipal clearance, the acceptance by heritage committee has come as a shot in the arm. Realising the importance for space at CIRCOT the Standing Finance Committee has allocated resources for the building while clearing the proposal for Plan expenditure for CIRCOT during the XI Plan. The entire staff would like to place on record their profound gratitude to the Hon'ble Secretary, DARE and DG, ICAR and other senior officials of the Council for providing a substantially higher allocation for CIRCOT for the Plan budget. Now it is the time for the Institute to perform and scale newer heights.

In consonance with the Council's policy of outreach, technology dissemination and commercialization, the Institute organized several awareness meets, workshops and took part in exhibitions and kisan melas, that saw the participation of different clientele groups and stake holders. The opportunity provided was utilized to forge in new alliances and also to finalise a few contract research and commercialization initiatives.

In all, CIRCOT continues to move forward with greater vigour and enthusiasm to serve the cotton sector at large and the primary sector and cotton growers in particular.

S. Sreenivasan  
Director

## Executive Summary

This Eighty Fourth Annual Report of CIRCOT covers the period from April 1, 2007 to March 31, 2008.

**Introduction** : CIRCOT was established as a Technological Laboratory under the Indian Central Cotton Committee (ICCC) in 1924. The ICCC was abolished along with other commodity committees in 1966 and the administrative control of the laboratory was taken over by the Indian Council of Agricultural Research (ICAR). The laboratory was renamed as Cotton Technological Research laboratory. To intensify the research and reorient the activities in consonance with the research priorities of ICAR, new mandates were formulated. The laboratory was renamed as Central Institute for Research on Cotton technology on April 1, 1991.

CIRCOT continued as the coordinating centre for technology under the All India Coordinated Cotton Improvement Project and over 6,000 samples were evaluated for their fibre properties and spinning potential. More than 3,200 cotton samples from various breeding trials were assessed at the headquarters for fibre quality, while at the Regional Quality Evaluation Units more than 20,000 samples belonging to initial stages of breeding trials were evaluated.

The Library at CIRCOT has a total of 6290 books and 7746 bound volumes of

Journals. The library also subscribes to CDROM databases of Indian and ASTM Standards, AATCC and World Textile Abstracts. CIRCOT continued to be recognised as a post graduate institution affiliated to the Mumbai University.

During the year under review, twenty-five projects, including externally aided programmes were in operation under different core areas.

During the period under report one IRC, one RAC and one Management Committee Meetings were held. The Quinquennial Research Team (QRT) of CIRCOT for 2002-2007 also had several meetings with the staff during the year under review and prepared its report in a draft form.

The following Seminars/Workshops were conducted during 2007-2008 :

- National Seminar on **Emerging Potential of Cottonseed and its Byproducts** was held on April 10, 2007
- The **Third Review Meeting of the CFC funded Project on Utilisation of Cotton Plant Byproduce for Value Added Products** was held on May 25, 2007
- **NAIP Stakeholders Workshop** of the proposed project **A Value Chain for Cotton Fibre, Seed and Stalks : An**



- o Ginning and Utilisation of Cotton Stalks for Board Making at Guntur on February 23, 2008
    - o Picking of seed cotton, on-farm storage and Transportation at Udumalapet near Pollachi on March 5, 2008
    - o Clean Cotton Picking and Demonstration to Farmers on Uprooting and Chipping of Cotton Stalk at Khadka (Jaipur) in Wardha District on March 18, 2008
  - Apart from this eight lectures were arranged for the staff of the Institute during the period under review.
- Research Highlights :**
- A full scale evaluation was made to compare the effects of roller ginning and saw ginning on the fibre and yarn properties of 5 cotton cultivars under a study on Design and Development of a Prototype Variable Speed saw Gin. The method of ginning had no appreciable effect on the strength, uniformity, elongation, Micronaire value and neps. The 2.5 % span length in case of saw ginned lint was found to be smaller by 0.5 to 1.0 mm than that of DR ginned cotton. The productivity of saw gin was at its optimum when the processing speed was 750 rpm. The cleaning efficiency of the air jet cleaner attached with the machine was higher at lower speeds.
- To find out the influence of storing conditions on bale quality, 50 quintals of seed cottons of 3 varieties - MCU.5, Bunny
- **Innovation for Higher Economic Returns to Farmers** was held on July 20, 2007
  - **Vigilance Awareness Week** was celebrated during November 12-16, 2007
  - **Communal Harmony Week** was celebrated during November 19-25, 2007
  - The **Launch Workshop of A Value Chain for Cotton Fibre, Seed and Stalks : An Innovation for Higher Economic Returns to Farmers** was held on January 9, 2008
  - **NAIP Stakeholders Workshop** of the proposed project **Synthesis and Characterisation of Nano-cellulose and its Application in Biodegradable Polymer Composites to Enhance their Performance** was held on January 18-19, 2008
  - **Review Meeting of Network Project on Ramie** was held on February 25, 2008
  - **Awareness Meets** on various topics were held as follows :
    - o Demonstration for the preparation of particle board at GTC, Nagpur on April 28, 2007.
    - o Demonstration of Cotton Stalk Collection and Chipping at Sirsa on November 21, 2007
    - o Demonstration of Clean Cotton Picking and Ginning and Supply Chain Management of Cotton Stalk at Umri Wagh on November 24, 2007

## EXECUTIVE SUMMARY

and LRA.5166 were processed and 3 bales each from first 2 cultivars and 4 bales of LRA.5166 were made at GTC of CIRCOT, Nagpur. Fibre properties, moisture content and microbial load on the fibres belonging to these varieties were analysed before bales were made. After one month one bale of each variety was opened and samples were drawn from different layers and fibre properties, moisture content and microbial load of these varieties were analysed from the fibre samples. It was observed that actinomycetes count was maximum and fungal colonies were lesser in number in samples of MCU.5 and Bunny varieties.

For a performance evaluation of cyclones used in modern ginneries, dust concentrations at different processing stations in 3 modernised ginneries were recorded at  $PM_{2.5}$  and  $PM_{10.0}$  levels. The maximum dust concentration was recorded at precleaner stage at both  $PM_{2.5}$  and  $PM_{10.0}$  levels. A lab model cyclone system has been designed to evaluate the performance and optimisation of different parameters of 1D2D and 1D3D cyclones.

A software to generate customised barcode labels for identification of every individual cotton bales has been developed. Designed labels can accommodate textual information about the bales which could be used by ginning factories for bale marking. A database application along with a software for reading the barcodes of bales is being developed to enable ginners to keep track of their bales as well as their quality parameters.

Under a study on development and evaluation of the cleaning machinery for

mechanically picked cotton in a project entitled **Mechanisation of Cotton production TMC MMI (2.3)**, modifications are being carried out on the stick machine and saw band type cleaner developed earlier by CIRCOT. These modifications are intended to improve the cleaning efficiency particularly of the leafy matter in the mechanically picked cotton.

Under the All India Coordinated Cotton Improvement Project (AICCIP) 7136 samples were tested at Mumbai and Regional Stations. The technological report for 2007-08 was presented at the Annual Workshop of AICCIP held in April 2007. Apart from these, a large number of samples belonging to various agricultural trials were also evaluated for the quality.

Forty-three standard cotton varieties were received during the year from different agricultural universities. All the samples were analysed for their fibre, spinning and yarn properties and results issued by way of Technological Circulars.

During the year 73 trade varieties of Indian cottons were received from different locations for the 2007-08 season. The fibre, spinning and yarn tests are being carried out on all these samples.

Under a study on wear comfort properties of knitted fabrics, flat knitted fabrics of various knit densities were prepared from DCH.32, Digvijay, G.Cot.21, G.Cot.10 and G.Cot.23. Five cycles of wash and dry process were carried out for dimensional fixation. Physical parameters and comfort properties of these fabrics were

evaluated. It was observed that knit density and GSM of the fabrics influence the comfort parameters. The air permeability decreased with increase in knit density and fineness. Water vapour transportation time increased as the fineness increased and had a linear relation with air permeability.

A lap preparation machine for microspinning of cotton samples has been developed which is suitable for opening cotton samples weighing 60-100 gms and then converting it into a mini lap in about 15 minutes. Opening and lap preparation with this new machine is being compared with that done by the existing manual method of opening cotton and lap preparation.

The demand model evolved for the consumption of cotton fibre in textile sector showed that the demand for raw cotton was inversely related to domestic prices and positively related to installed spinning capacity. Import demand for raw cotton was positively related to domestic price but negatively related to international price. Domestic price and production significantly affected the export demand for raw cotton. Cotton yarn export was negatively related to domestic price and positively correlated to international price. The yarn price was dependent upon domestic demand for consumption in powerloom, handloom and textile mills.

Under a study on processing of banana pseudostem for fibre extraction and its utilisation for preparation of value added products it was seen that banana fibres could be spun on jute spinning system.

Blending 20% jute with banana fibres improved the breaking extension and tenacity. Paper produced from cut fibres obtained from scutcher waste was of very good quality while that made from long textile grade fibres was even much better. The quality of the paper improved with use of NaOH in pulp preparation. About 15-20 kg of the banana fibres were spun into yarn and plain woven fabric of 250-400 GSM. Fabric properties are being analysed.

One hundred kg of decorticated ramie fibres were subjected to biochemical processing and bleaching under the project on the development of improved cultivation package of ramie (*Boehmeria nivea* L Gaud) for different agro-climatic conditions and technological improvement of the fibre for textile. The bleached fibres were stapled and blended with Shankar 6 cotton and spun. It was observed that 30 % ramie with 70 % cotton resulted in better properties. The blended yarns were converted into fabrics and garments at SITRA, Coimbatore.

The Launching Workshop of the NAIP Project under Component 2 entitled **A Value Chain for Cotton Fibre, Seed and Stalks : An Innovation for Higher Economic Returns to Farmers** was held on January 9, 2008. The first Consortium Implementation Committee Meeting and the First Consortium Advisory Committee Meetings were also held on January 9, 2008. As a part of the preliminary work 10 hanks of cotton yarn were bioscoured using CIRCOT technology and dyed with natural dyes.

Thirty tons of cotton stalks have been chipped at Jaipur village in Wardha District

## EXECUTIVE SUMMARY

and transported to GTC, Nagpur for preparation of particle boards. Two awareness meets for farmers, one at Coimbatore region and another at Nagpur region were held in which demonstrations on clean cotton picking, on-farm storage and transportation of seed cotton and collection, cleaning, chipping and transportation of cotton stalks to board industry were held.

Another launch workshop of NAIP sponsored project with CIRCOT as partner under component 4 – Design and Development of Rubber Dams for Watersheds was held on March 1, 2008 at IRMRA, Thane. Preliminary work on survey of rural communes in Narangi Village, Raigad District and rubber dam site on Jhanjavati river in Vijayawada, Andhra Pradesh was carried out.

Under the Quality evaluation of Cotton Fibres project under TMC 4.1, 970 samples of 2007-08 season were tested for fibre properties. Out of the 970 samples, 100 samples were found promising and 31 samples showed high strength value than what is proposed in the quality norms for a given staple.

Under a study on application of nanoparticles in paper coating, trials were carried out using laboratory coater under conditions similar to commercial coating. Coated webs were cut into A4 size sheets and calendered. The optical and printing properties of the paper samples were evaluated. It was observed that the brightness, whiteness and print density of nano zinc oxide coated paper samples were higher than those of bulk zinc oxide coated

paper. The glossiness, smoothness and print uniformity improved when china clay was mixed with nano zinc oxide in equal proportion. Nano zinc oxide coated paper showed no fungal and bacterial growth on and around the paper. Nano zinc oxide coated paper exhibited more UV resistance than bulk zinc oxide coated paper.

To study the application of zinc oxide nanoparticles for imparting different functional finishes to cotton textiles, zinc oxide soluble starch nanocomposites were synthesised using a novel wet chemical process. The nano-Zno impregnated cotton fabrics showed excellent antibacterial activity against two representative bacteria. More than 99% activity was retained till 15 hand washes. The antibacterial activity was maintained even after exposure to harsh conditions. A simple protocol for the preparation of zinc oxide *in situ* on the surface of cotton fabric is being explored.

Nano silver was produced by two novel methods (microbial and biochemical) and characterised in the context of application of silver nanoparticles for antimicrobial finishing of cotton textiles. Nano silver particles showed excellent antibacterial activity against two representative bacteria. Low concentration of nanosilver when coated on cotton fabrics resulted in uniform coloured yellowish coating on the fabric but had insignificant antibacterial activity. High concentration resulted in patchy appearance of yellow colour on the fabric.

For a study on spectroscopic and chromatographic characterisation of natural dyes, HPTLC patterns of the extracts from

marigold (3 types), chrysanthemum (2 types) and aster flowers were developed in a solvent system. It was observed that the basic HPTLC pattern of all marigold flowers was similar and was different from those of chrysanthemum and aster flowers. Part of aster HPTLC pattern resembled the basic pattern of chrysanthemum flowers. The basic HPTLC pattern could serve as a marker for identification of the flowers.

Attempts were made to evaluate the effect of various sugars, sodium salts and nitrogen sources on the production of xylanase by *Aspergillus niger* by solid state fermentation and its application to lignocellulosic materials. Sodium chloride was found to increase the xylanase production while sugars did not enhance the production. Sodium nitrate produced 30 % more xylanase. Work on application of xylanase to reduce the use of liquor by pretreatment of xylanase to bagasse pulp and hydrolysis of cottonseed hulls to produce sugar is being carried out.

For scale-up trials on crosslinking of cotton blended fabrics with polycarboxylic acid mixtures, different trials of crosslinking were conducted by changing the M:L ratio and pH of mixture. The fabric could be uniformly treated even at low M:L ratio with no adverse effect on fabric. Comfort properties were also improved after crosslinking. Multiple washings did not affect the physical properties of crosslinked fabrics. However, comfort properties decreased on multiple washings. Even after repeated observations, it was noted that the air permeability values for crosslinked

fabrics improved. A decrease in thermal insulation value was also observed for crosslinked cotton fabrics.

To study the DP finishing of dyed fabric, 12 ready for dyeing (RFD) cotton fabrics were dyed using hot brand reactive dye Procion Brill. Blue H-5G and Procion Brill. REd H-8B. CIElab and K/s measurements were carried on all the samples. Two fabrics each of different shades were treated for durable press finish. Various quality parameters were estimated for all the samples. In case of blue dyed fabrics CRA values were highest for 3% shade treated at 3.5 pH and for samples dyed with red dye, CRA values were same for 1.5% and 3% shades. Both the samples tended to become yellowish as compared to untreated control samples. DP rating was about 4 to 4-5 for red dyed samples and 4 for blue dyed samples. Fastness to washing and perspiration improved marginally after DP treatment. Best physical properties were exhibited by samples dyed at 1.5% shade and treated for durable press with 4% PCA mixture, M:L at 1:3 pH at 3.5 and cured at 180°C.

Titania nanoparticles were synthesised using 2 different precursors titanium isopropoxide and titanium tetrachloride for a study on synthesis of titanium dioxide nanoparticles and its application onto cotton fabrics for antibacterial as well as self cleaning properties. The product was characterised by X-ray diffraction, UV visible spectrophotometer and spectrofluorometer. The nano titania gave broader X-ray peaks as compared to commercial

## EXECUTIVE SUMMARY

titania. This was supported by the UV visible absorption spectrum.

To determine and characterise oil and protein in Bt cottonseeds, 40 Bt cottonseed samples pertaining to  $F_1$  and  $F_2$  generations were evaluated for oil content. Protein content of 16 samples was also estimated. The oil content in  $F_2$  seeds of Bt was comparatively lower than that in its non-Bt counterpart.

A cotton stalk supply chain methodology has been established under a project entitled Utilisation of Cotton Plant By-produce for Value Added Products. Chipping of stalks in the field itself with a mobile chipper and transportation of the chips to board industry situated not farther than 50 kms has been found to be feasible and economical. Boards (4' × 3') of 9 mm, 12 mm and 18 mm thickness are being prepared in the demonstration plant at GTC, Nagpur.

Modifications have been incorporated in the roller type cotton stalk compacting machine developed earlier and its performance evaluation was undertaken.

Conditions have been standardised to prepare absorbent cotton from Bengal Desi cotton. Samples subjected to 48 hours anaerobic treatment at room temperature followed by hot water treatment resulted in absorbent cotton. Bleaching was also resorted to with  $H_2O_2$  depending upon the end use.

**Extension Activities :** The Director and scientists of CIRCOT continued as members of various committees of BIS for cotton and textile testing, and in various panels of organisations like ATIRA, BTRA, SITRA, UICT, etc. Some of the key extension activities of CIRCOT during the period were (i) supply of accurate and reliable data on quality aspects of fibres, yarns and fabrics, (ii) consultancy services, (iii) publication of research results by way of scientific papers, leaflets and booklets for the benefit of the appropriate user groups and (iv) dissemination of technical information through training programmes.

The testing house received over 2870 samples of fibre, yarn and fabric for different kinds of tests while at the Regional centres about 3100 samples were tested. Training courses on cotton quality evaluation were conducted at the headquarters for about 62 persons engaged in textile trade and industry. This includes special courses on HVI and AFIS instruments organised for appropriate user groups. At GTC, Nagpur, around 240 sponsored personnel were trained on various aspects of cotton ginning. CIRCOT also participated in various exhibitions to popularise the technologies developed at the Institute. The resource generation at CIRCOT during 2007-08 by commercial sample testing, consultancy research and training activities was Rs. 66.43 lakhs.



## सार संक्षेप

यह केन्द्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान के 1 अप्रैल, 2007 से 31 मार्च, 2008 तक की चौरासीवीं वार्षिक रिपोर्ट है।

### भूमिका :

सन् 1924 में केन्द्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान (के.क.प्रौ.अनु.सं.) की स्थापना भारतीय केन्द्रीय कपास समिति (भा.के.क.स.) के अंतर्गत प्रौद्योगिक प्रयोगशाला के रूप में हुई। सन् 1966 में भारतीय केन्द्रीय कपास समिति का अन्य व्यावसायिक समितियों के साथ समापन कर दिया गया और तब भारतीय कृषि अनुसंधान परिषद ने इस प्रयोगशाला को अपने प्रशासनिक नियंत्रण में ले लिया। इस प्रयोगशाला का नाम बदलकर कपास प्रौद्योगिकी अनुसंधान प्रयोगशाला रखा गया। कृषि अनुसंधान कार्यों में तेजी लाने और संस्थान के अनुसंधान कार्यकलापों को प्रधानता व नया मोड़ देने के लिए नये सिद्धांत बनाये गये। 1 अप्रैल 1991 से इस प्रयोगशाला का नाम पुनः बदलकर केन्द्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान रखा गया, जो संस्थान का वर्तमान नाम भी है।

केन्द्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान ने अखिल भारतीय कपास सुधार समन्वित परियोजना (अ.भा.क.सु.स.प.) के अंतर्गत तकनीकी सहभागी के रूप में काम करते हुए इस वर्ष लगभग 6000 से अधिक कपास के नमूनों की तंतु गुणवत्ता के अलावा बहुत से नमूनों का कताई परीक्षण भी किया। वर्तमान वर्ष के

दौरान देश के विभिन्न कपास प्रजनकों से प्राप्त 3200 से भी अधिक कपास के नमूनों का तंतु परीक्षण मुख्यालय में किया गया, जबकि क्षेत्रीय गुणवत्ता मूल्यांकन इकाइयों द्वारा प्रयोग की प्रारंभिक अवस्थाओं से प्रजनित 2000 से अधिक कपास के नमूनों के तंतु गुणों का परीक्षण किया गया।

संस्थान के पुस्तकालय में कुल 6290 पुस्तकें एवं 7746 जिल्द लगे शोध पत्र वे खण्ड उपलब्ध हैं। साथ ही संस्थान के पुस्तकालय में भारतीय व ए.एस.टी.एम. स्तर के सीडी रोम डाटा बेस एवं ए. ए. टी. सी. व वर्ल्ड टेक्सटाइल तथ्य भी उपलब्ध हैं। इस संस्थान को मुम्बई विश्वविद्यालय की स्वीकृति से स्नातकोत्तर संस्थान के रूप में मान्यता जारी है।

रिपोर्ट की अवधि के दौरान बाहरी निधि की मदद से चल रहे कार्यक्रमों को मिलाकर विभिन्न कोर क्षेत्रों में कुल पच्चीस परियोजनाओं के तहत शोधकार्य जारी थे।

संस्थान में रिपोर्ट की अवधि के दौरान एक आई.आर.सी., एक आर.ए.सी. तथा एक प्रबंधन समिति की बैठकों का आयोजन हुआ। संस्थान की वर्ष 2002-2007 के लिए बनी पंचवार्षिक शोध दल की कई बैठकें संस्थान के वैज्ञानिकों के साथ आयोजित की हुईं।

संस्थान में वर्ष 2007-08 के दौरान निम्नलिखित सम्मेलनों एवं कार्यशालाओं का आयोजन किया गया।



1. “इमर्जिंग पोटेन्शीयल ऑफ कॉटनसीड एन्ड इट्स बाय प्रॉडक्ट्स” पर 10 अप्रैल 2007 को राष्ट्रीय सम्मेलन आयोजित किया गया ।
2. मूल्य संवर्धित कपास के उपोत्पाद के विकास व बेहतर उपयोगिता के लिए तीसरी पुनर्वलोकन बैठक का आयोजन 25 मई, 2007 के दिन किया गया ।
3. राष्ट्रीय कृषि नवोन्मेषी परियोजना के अंतर्गत संस्थान में शेयर धारकों की “कपास रेशे, बिनौले और डंठलों के लिए मूल्य कड़ी : किसानों के लिए उच्च आर्थिक लाभ का नवोन्मेष” कार्यशाला 20 जुलाई को आयोजित की गयी ।
4. संस्थान में 12-16, नवम्बर, 2007 के दौरान सतर्कता जागरुकता सप्ताह मनाया गया ।
5. संस्थान में 19 से 25 नवम्बर, 2007 तक कौमी एकता सप्ताह मनाया गया ।
6. राष्ट्रीय कृषि नवोन्मेषी परियोजना (एन.ए.आय.पी) के अंतर्गत संस्थान में 9 जनवरी 2008 के दिन “कपास रेशे, बिनौले और डंठलों के लिए मूल्य कड़ी : किसानों के लिए उच्च आर्थिक लाभ का नवोन्मेष” के लिए उद्घाटन कार्यशाला आयोजित की गयी ।
7. राष्ट्रीय कृषि नवोन्मेषी परियोजना (एन. ए. आय. पी. ) में विभिन्न भागीदारों की “नैनो-सेल्यूलोज के संश्लेषण व अभिलक्षण एवं इनके जैव अपघटक पॉलिमर कम्पोजिट के निष्पादन क्षमता का विस्तार” पर प्रस्तावित परियोजना पर दो दिवसीय कार्यशाला दिनांक 18 और 19 जनवरी को आयोजित की गई ।
8. रैंकी पर नेटवर्क परियोजना की पुनर्निरीक्षण बैठक का आयोजन दिनांक 25 फरवरी, 2008 का किया गया ।
9. विभिन्न विषयों पर जागरुकता बैठकें आयोजित की गई जो निम्नलिखित हैं :
  - (i) सिरसा में दिनांक 21 नवम्बर, 2007 को कपास डंठलों की चुनाई व कटाई की प्रक्रिया का प्रदर्शन किया गया ।
  - (ii) स्वच्छ कपास की चुनाई व ओटाई एवं कपास डंठलों की आपूर्ति कड़ी प्रबंधन का प्रदर्शन दिनांक 24 नवम्बर, 2007 को उमरी वाघ में किया गया ।
  - (iii) ओटाई एवं कपास डंठलों की मूल्यवर्धित उत्पादों के लिए उपयोगिता विषय पर जागरुकता बैठक का आयोजन दिनांक 23 फरवरी, 2008 को गुन्दूर में हुआ ।
  - (iv) कपास फसल की चुनाई, खेतों में भंडारण एवं धुलाई विषय पर दिनांक 5 मार्च, 2008 को पोलाची के पास उदमलपेठ में जागरुकता बैठक आयोजित की गयी ।
  - (v) स्वच्छ कपास की चुनाई एवं कपास डंठलों को जड़ से उखाड़ने एवं कटाई की प्रक्रिया का प्रदर्शन किसानों के समक्ष दिनांक 18 मार्च, 2008 को वर्धा जिले के खड़का (जयपुर) में किया गया ।
10. इन सभी कार्यशालाओं व बैठकों के अलावा संस्थान के कर्मचारियों के लाभ हेतु आठ व्याख्यानो का आयोजन भी किया गया ।

### अनुसंधान की विशिष्टताएँ :

एक प्रोटोटाइप वेरियेबल स्पीड आरा ओटाई मशीन की योजना एवं विकास के अध्ययन के अंतर्गत रोलर ओटाई मशीन व आरा ओटाई मशीन के प्रभाव की तुलना के लिए 5 कपास की प्रजातियों के रेशों व सूतों के गुणों का पूर्ण पैमाने पर मूल्यांकन किया गया। ओटाई के विभिन्न तरीकों का कपास के रेशों की ताकत, एकरूपता, खिंचाव, माइक्रोनेयर मान और गांठ पर कोई खास प्रभाव नहीं पड़ा। डबल रोलर ओटाई मशीन की तुलना में आरा ओटाई मशीन से ओटाई किये गये कपास के रेशों की 2.5% स्पान लंबाई 0.5 से 1.0 मिली मीटर तक कम पायी गयी। आरा ओटाई मशीन की उत्पादकता 750 परिक्रमण प्रति मिनट पर अधिकतम पायी गयी। इस मशीन में लगे वायु जेट परिष्कारक की परिष्करण क्षमता कम गति पर अधिक पायी गयी। कपास के बीजों को पृथक करके परिष्कृत बीजों को प्राप्त करने की प्रक्रिया का आरा ओटाई व रोलर ओटाई प्रकार के मशीनों पर तकनीकी-आर्थिक रूप से प्रभावी प्रक्रमों का विकास करने के लिए परीक्षण किया गया। परीक्षण करने पर आरा ओटाई मशीन की तुलना में डबल रोलर ओटाई मशीन के द्वारा 15.8% अधिक कपास परिष्कृत होते देखा गया।

कपास की भंडारण व्यवस्था का कपास की गांठों की गुणवत्ता पर पड़ने वाले प्रभाव का अध्ययन करने के उद्देश्य से सिरकॉट के जी.टी.सी. नागपुर में 3 प्रजातियों - एम.सी. यू.5, बन्नी व एल.आर.ए. 5166 में से प्रथम दो के 3 गांठ व एल. आर.ए. 5166 के दो गांठों का भंडारण किया गया। गांठ बनाने के पहले इन कपास की प्रजातियों के रेशों के गुणधर्म, आर्द्रता की मात्रा एवं जीवाणुओं की उपस्थिति का अध्ययन किया

गया। एक माह के पश्चात कपास के इन तीनों प्रजातियों की गांठों को खोलकर उनके अलग - अलग स्तरों से कपास के नमूनों को निकालकर उन रेशों के गुणधर्म, आर्द्रता की मात्रा व जीवाणुओं की उपस्थित मात्रा के विस्तार में परीक्षण द्वारा अध्ययन किया गया। यह पाया गया कि एम.सी. यू.5 व बन्नी प्रजाति के नमूनों में एक्टीनोमाइसाइट्स की संख्या अधिकतम एवं फफूंदी का जमाव कम था।

आधुनिक ओटाई कारखानों में लगे चक्रवालों की क्षमता का मूल्यांकन करने के लिए तीन आधुनिक ओटाई कारखानों के विभिन्न प्रक्रम-स्थलों पर से धूल-कणों की सान्द्रता PM2.5 एवं PM10.0 स्तरों पर दर्ज की गयी। अधिकतम धूल-कणों की सान्द्रता दोनों ही स्तरों, PM2.5 एवं PM10.0 में प्रीक्लीनरों पर दर्ज की गयी। 1D2D एवं 1D3D चक्रवातों के विभिन्न गुणों की क्षमता व निर्धारण प्रवृत्तियों का मूल्यांकन करने के लिए एक प्रयोगशाला मॉडल चक्रवात विकसित करने की योजना बनायी गयी।

हर अलग-अलग कपास की गांठों की पहचान के लिए कम्प्यूटर साफ्टवेयर विकसित किया जा रहा है, जिससे विभिन्न बार कोड लेबल प्रजनित हो पायेंगे। ओटाई कारखानों में कपास की गांठों को इन विकसित लेबलों द्वारा चिन्हित किया जायेगा, जिनमें गांठों से संबंधित लिखित सूचना भी होगी। गांठों में चिपके बार कोड के लेबलों को पढ़ने के लिए एक डाटाबेस, साथ ही एक साफ्टवेयर विकसित किया जा रहा है ताकि ओटाई करने वाले अपने गांठों व उनकी उत्तम गुणों को सही तरह से संभालकर रख सकें।

मशीन द्वारा कपास की चुनाई प्रक्रिया के परिष्करण मशीन / यंत्र के विकास एवं मूल्यांकन के अध्ययन के

अंतर्गत एक परियोजना, नामित “कपास उत्पादन का मशीनीकरण / यंत्रिकरण टी.एम.सी. एम.एम.आई (2.3)” में सिरकॉट द्वारा पूर्व में विकसित स्टिक यंत्र व आरा बैंड टाईप क्लिनर में सुधार का कार्य जारी है। इन सुधार प्रक्रियाओं द्वारा परिष्करण यंत्रों की परिष्करण क्षमता में विकास होगा।

अखिल भारतीय समन्वित कपास सुधार परियोजना (ए.आई.सी.सी.आई.पी.) के अंतर्गत सिरकॉट, मुम्बई और इसकी क्षेत्रीय इकाईयों में कुल मिलाकर 7136 कपास के नमूनों का परीक्षण किया गया। वर्ष 2007-2008 की ए.आई.सी.सी.आई.पी. की तकनीकी रिपोर्ट अप्रैल 2007 के दौरान वार्षिक कार्यशाला में प्रस्तुत की गयी। इसके अलावा तन्तु परीक्षण विभाग द्वारा अन्य कृषि ट्रायलों द्वारा उपजाये कपास के नमूनों के तन्तु गुणों का परीक्षण भी किया गया। विभिन्न कृषि विश्वविद्यालयों से तैतालीस मानक प्रजाति के कपास के नमूने इस वर्ष के दौरान प्राप्त हुए। सभी कपास के नमूनों का विश्लेषण इनके तन्तु गुणों, कताई व सूतों के गुणों के आधार पर किया गया और परिणामों को तकनीकी परिपत्र के रूप में जारी किया गया।

इस वर्ष 2007-08 के दौरान भारतीय कपास की 73 व्यावसायिक प्रजातियाँ विभिन्न क्षेत्रों से प्राप्त हुईं। इन सभी 73 नमूनों के रेशा कताई व सूत परीक्षण किये गये।

बुने हुए वस्त्रों की आरामदेयता गुणों के अध्ययन के अंतर्गत विभिन्न बुनाई घनत्व वाले डी.सी.एच. 32, दिग्विजय, जी.कॉट. 21, जी.कॉट. 10 व जी.कॉट. 23 कपास की प्रजातियों के पलैट बुने हुए वस्त्र तैयार किये गये। कपड़ों की लंबाई-चौड़ाई की माप निर्धारित करने

के लिए वस्त्रों को धोने व सुखाने की प्रक्रिया पाँच बार दुहरायी गयी। इसके बाद इन वस्त्रों का मूल्यांकन भौतिक पैरामीटर व पहनाने की आरामदेयता के लिए किया गया। ऐसा पाया गया कि बुनाई का घनत्व व जी.एस.एम. वस्त्रों को आरामदेयता गुणों को प्रभावित करते हैं। वस्त्रों की वायु पारगम्यता वस्त्रों के बुनाई घनत्व व रेशों के महीनता के बढ़ने पर घटती है। साथ ही महीनता के बढ़ने पर जलवाष्प परिवहन समय में भी वृद्धि पायी गयी व वायु पारगम्यता के साथ रैखिक संबंध पाया गया।

कपास के नमूनों की सूक्ष्म कताई के लिए लैप / रुई की मोटी परत बनाने वाली मशीन विकसित की गई, जिसके द्वारा लगभग 15 मिनट के दौरान 60 से 100 ग्राम कपास के नमूनों को खोलना व लैप बनाना संभव होगा। इस नई विकसित मशीन की तुलना पहले से उपलब्ध मशीनों के द्वारा कपास के नमूनों को खोलकर व लैप बनाकर किया गया।

वस्त्र उद्योग के क्षेत्र में कपास के रेशों की खपत पर एक डिमांड-मॉडल विकसित किया गया और देखा गया कि कपास के कच्चे माल की मांग घरेलू मूल्यों के व्युत्क्रमानुपाती है, जबकि कताई क्षमता के समानुपाती है। कपास के कच्चे माल की आयात के लिए मांग घरेलू मूल्यों के समानुपाती व अंतर्राष्ट्रीय मूल्यों के व्युत्क्रमानुपाती पायी गयी। घरेलू मूल्यों व उत्पादन से भी कपास के कच्चे माल के निर्यात के लिए मांग पर खासा असर पड़ा। कपास के धागों का निर्यात घरेलू मूल्यों के व्युत्क्रमानुपाती व अंतर्राष्ट्रीय मूल्यों के समानुपाती पाया गया। धागों का मूल्य विद्युत करघा, हस्त करघा व कपड़ों के मिलों में खपत के लिए घरेलू मांग पर निर्भर रहा।

केले के पौधों के तनों से रेशा निकालने व इनका मूल्य संवर्धित उत्पाद बनाने के प्रक्रम के अध्ययन के अंतर्गत पाया गया कि केले के रेशों की कताई भी जूट की कताई प्रक्रिया जैसी ही की जा सकती है। केले के रेशों में 20% जूट मिश्रित करने पर इनकी टूटने का फैलाव व तन्यता में बड़ेतरी दर्ज की गयी। छोटे रेशों से तैयार कागज जो तंतु कर्षित (कूट कर निकाले गये रेशे) से प्राप्त हुए, काफी अच्छी गुणवत्ता वाले पाये गये, जबकि वस्त्रों वाले लंबे रेशों से बने पेपर की गुणवत्ता और भी उत्तम पायी गई। (पल्प) लुगदी बनाने की प्रक्रिया के दौरान NaOH का उपयोग करने पर कागज की गुणवत्ता में और भी सुधार पाया गया। लगभग 15 से 20 किलोग्राम केले के रेशों की कताई करके धागा बनाया गया एवं प्लेन बुनाई वाले 250 से 400 जी.एस.एम. के वस्त्र बनाये गये। वस्त्रों के गुणधर्मों के विश्लेषण का कार्य जारी है।

विभिन्न कृषि जलवायु अवस्था व वस्त्रों के लिए रेशों के तकनीकी विकास के लिए एक सौ किलोग्राम विवल्कित रैमी रेशों का अध्ययन बायोकेमिकल डिगामिंग व विरंजित करके रैमी के विकसित कल्टिवेशन पैकेज के लिए किया गया। इन परिष्कृत रेशों को संकर 6 कपास के साथ मिश्रित करके कताई की गयी। यह पाया गया कि 30% रैमी व 70% कपास के रेशों के मिश्रण का अच्छा परिणाम निकलता है।

दिनांक 9 जनवरी, 2008 के दिन एन.ए.आई.पी. परियोजना, घटक 2 के अंतर्गत “कपास रेशे, बिनौले और इंठलों के लिए मूल्य कड़ी : किसानों के लिए उच्च आर्थिक लाभ का नवोन्मेष” की उद्घाटन कार्यशाला का आयोजन हुआ। पहली संकाय कार्यान्वयन समिति व पहली संकाय सलाहकारी समिति की बैठकें दिनांक

9 जनवरी, 2008 को हुई। प्राथमिक कार्य के छोटे भाग के रूप में सिरकाट की तकनीक जैविक निघषण विधि द्वारा दस कपास के धागों की लच्छियों की धुलाई की गई व प्राकृतिक रंजको द्वारा रंजित कीया गया। वर्धा जिले के जयपूर गांव में तीस टन कपास के इंठलों को काटा गया, तत्पश्चात इन्हें पार्टिकल बोर्ड बनाने के लिए जी.टी.सी.नागपूर लाया गया। किसानों के लिए दो जागरुकता बैठकें आयोजित की गईं, जिनमें स्वच्छ कपास की चुनाई, खेतों में भंडारण एवं परिवहन व एकत्र करना, सफाई, कपास के इंठलों को काटना एवं उन्हें बोर्ड उद्योग तक परिवहन द्वारा पहुँचाना आदि कार्यों का प्रदर्शन किया गया।

अन्य एन.ए.आय.पी. परियोजना, घटक 4 के अंतर्गत “रबर बाँधों के जल विभाजक की योजना एवं विकास” की उद्घाटन कार्यशाला का आयोजन 1 मार्च, 2008 को हुआ। रायगढ़ जिले के नारांगी गाँव के ग्रामीण समुदाय एवं विजयवाड़ा, आन्ध्र प्रदेश के झंझावती नदी के रबर बांधों का सर्वेक्षण, परियोजना के प्राथमिक कार्यों के तौर पर किया गया।

कपास रेशों की गुणवत्ता मूल्यांकन परियोजना टी.एम.सी. 4.1 के अंतर्गत 970 कपास के नमूनों के तंतु परीक्षण रेशों के गुण-धर्मों के लिए किये गये। इन 970 कपास के नमूनों में 100 नमूने अच्छे व उत्तम गुणों वाले पाये गये एवं 31 नमूनों की काफी ताकत पायी गयी।

नैनो कणों का कागज पर विलेपन के अध्ययन के अंतर्गत व्यावसायिक विलेपण की परिस्थिति के अनुरूप प्रयोगशाला विलेपक का प्रयोग करते हुए परीक्षण किये गये। विलेपित जाल को सुविधा हेतु ए 4 आकार में काटकर प्रवीडित किया गया। विलेपित कागजों के छपाई

व प्रकाशिक गुणधर्मों का मूल्यांकन किया गया। साधारण जिंक आक्साइड विलेपित कागज की तुलना में नैनो जिंक विलेपित कागज, चमकीलेपन, सफेदी, छपाई घनत्व व छपाई एकरूपता और ग्रहण वेग गुणों में बेहतर पाये गये। जब चीनी मिट्टी को नैनो जिंक ऑक्साइड के साथ समान अनुपात में मिश्रित किया गया तो चमकीलापन, चिकनाई व छपाई घनत्व गुणों में सुधार दिखाई दिया। नैनो जिंक आक्साइड कणों द्वारा विलेपित कागजों के ऊपर और चारों ओर कवक व जीवाणु का विस्तार नहीं हुआ। नैनो जिंक आक्साइड विलेपित कागज साधारण जिंक आक्साइड विलेपित कागज की तुलना में बेहतर पराबैंगनी किरण प्रतिरोधी पाये गये।

जिंक आक्साइड नैनो कणों के प्रभाव के अध्ययन व कपास वस्त्रों पर प्रकार्यात्मक परिष्करण प्रदान करने के लिए घुलनशील जिंक आक्साइड नैनोकम्पोजिट का संश्लेषण उत्कृष्ट गीले रसायन प्रक्रिया द्वारा किया गया। नैनो जिंक ऑक्साइड द्वारा उपचारित कपास के कपड़ों ने दो प्रतिनिधि जीवाणुओं के विरुद्ध उत्कृष्ट जीवाणु प्रतिरोधी गुणों का प्रदर्शन किया। 15 बार कपड़ों की हाथ से धुलाई तक 99% से अधिक गुण मौजूद रहते हैं। बुरी अवस्था में भी जीवाणु प्रतिरोधी गतिविधि कपड़ों में विद्यमान रहती है। जिंक ऑक्साइड तैयार करने एवं वस्त्रों के ऊपर उपचारित करने की विधि का एक सामान्य नयाचार का अन्वेषण किया गया।

नैनो सिल्वर का उत्पादन दो उत्कृष्ट विधियों (सूक्ष्मजैविक एवं जैव रासायनिक) द्वारा किया गया एवं कपास के वस्त्रों के प्रतिसूक्ष्मजैविक परिष्करण के लिए सिल्वर नैनो कणों के प्रभाव के अध्ययन के लिए इनका अलिखित किया गया। इन कपड़ों ने दो प्रतिनिधि जीवाणुओं पर उत्कृष्ट प्रतिजीवाण्विक गुण का प्रदर्शन

किया। नैनो सिल्वर की कम सान्द्रता का जब वस्त्रों पर विलेपन किया गया तो उसका परिणाम वस्त्रों पर एकरूप पीले विलेपन के रूप में आया एवं उनकी जीवाणु प्रतिरोधी क्षमता भी नगण्य पायी गई। सान्द्रता बढ़ने का असर कपड़ों पर पीले धब्बे के रूप में दिखा।

प्राकृतिक रंजकों के स्पेट्रोस्कोपिक व क्रोमेटोग्राफिक अभिलक्षणों के अध्ययन हेतु विलायक माध्यम में गेंदों के फूलों के तीन प्रकार, क्रायसन्थेमम के दो प्रकार एवं एस्टर फूलों के निचड़ों के एच. पी. टी. एल. सी. पैटर्न विकसित किये गये। यह पाया गया कि मौलिक एच. पी. टी. एल. सी. पैटर्न गेंदों के सभी फूलों के लिए एक समान थे एवं क्रायसन्थेमम व एस्टर फूलों के लिए भिन्न-भिन्न थे। एस्टर फूलों के कुछ एच. पी. टी. एल. सी. पैटर्न क्रायसन्थेमम फूलों के मौलिक पैटर्न से मिलते थे। एच. पी. टी. एल. सी. के मौलिक पैटर्न द्वारा फूलों के प्रकार की पहचान की जा सकती है।

जायलेन्स के उत्पादन पर विभिन्न प्रकार के चीनी, सोडियम, लवण एवं नाइट्रोजन स्रोतों के प्रभाव एसपरजेलस निगर द्वारा ठोस अवस्था कीप्वन एवं उनके लिग्नोसेल्यूलोजिक पदार्थों के उपयोगों को जानने का प्रयास किया गया। जायलेन्स का उत्पादन बढ़ने के लिए सोडियम क्लोराइड का प्रयोग किया गया, जबकि सूगर के प्रयोग से उत्पादन नहीं बढ़। सोडियम नाइट्रेट से 30% अधिक जायलेन्स का उत्पादन हुआ। जायलेन्स के प्राथमिक उपचार द्वारा बगास लुगदी एवं बिनौले के छिलकों का जल-अपघटन चीनी उत्पादन के लिए करते वक्त विलायक की कम मात्रा के प्रयोग पर कार्य हुआ।

बहु कार्बोजैलिक अम्ल मिश्रण के साथ कपास के मिश्रित वस्त्रों के तिर्यक बंधक ट्रायल एम:एल अनुपात

एवं पी.एच. बदल-बदल कर किये गये । कम एम:एल अनुपात पर बिना किसी प्रतिकूल प्रभाव के वस्त्रों पर एक समान उपचार किये गये । तिर्यक बंधक के द्वारा आराम देने वाले गुणों में भी सुधार हुआ । तिर्यक बंधक वस्त्रों की बार-बार धुलाई करने के बाद भी उनके भौतिक गुणों में -हास नहीं पाया गया । कई बार की धुलाई के बाद आराम देने वाले गुणों में थोड़ा -हास पाया गया । कई बार अवलोकन करने के बाद पाया गया कि तिर्यक बंधक वस्त्रों की वायु पारगम्यता बढ़ती है । तिर्यक बंधक कपास के वस्त्रों की तापीय रोधक क्षमता में भी कमी पायी गयी ।

रंजित वस्त्रों के डी.पी.परिष्करण के अध्ययन के लिए 12 रंजक के लिए तैयार (आर.एफ.डी.) वस्त्रों का गर्म ब्रान्डेड क्रियाशील प्रोसीन ब्रील रंजक के प्रयोग द्वारा रंजित किया गया । ब्लू एच-5 सी एवं प्रोसीन ब्रील, आर.डू. डी. एच. 8बी, सी.आई.ई. लैब एवं के / एस मापन सभी नमूनों पर किये गये । विभिन्न शेड के दो वस्त्रों का टिकाऊ दाब परिष्करण किया गया । सभी नमूनों के विभिन्न गुणों को मापा गया । नीले रंजित वस्त्रों के सी. आर. ए. का मान अधिकतम 3% शेड उपचार, 3.5 शेड पी.एच. पर तथा लाल रंजित वस्त्रों के सी. आर. ए. का मान 1.5% शेड व 3% शेड उपचार पर एक समान ही पाये गये । बगैर उपचारित सामान्य वस्त्रों की तुलना में इन वस्त्रों में अधिक पीलापन पाया गया । डी.पी.श्रेणीकरण का मान लाल रंजित वस्त्रों के लिए लगभग 4 से 4.5 एवं नीले रंजित वस्त्रों के लिए लगभग 4 पाया गया । डी.पी. उपचार के बाद वस्त्रों को बारंबार धुलाई के बाद रंग जाने के गुणों व पसीना सोखने की क्षमता में थोड़ा सुधार पाया गया । सबसे उत्तम भौतिक गुण 1.5 शेड एवं 4% पी.सी.ए. मिश्रण के साथ डी.पी. उपचारित वस्त्रों द्वारा दर्शाये गये जब इनका एम:एल

अनुपात 1:3, 3.4 पी.एच. 180°C तापक्रम पर रखा गया ।

दो मिल टायटेनिया आइसोप्रोपाइड एवं टायटेनियम टेट्राक्लोराइड का उपयोग करते हुए टायटेनियम नैनो कणों का संश्लेषण, टायटेनियम डायआक्साइड नैनो कणों के संश्लेषण एवं वस्त्रों के प्रतिजीवाण्विक व स्वयं स्वच्छता की क्षमता के अध्ययन के लिए की गई । इन उत्पादों को एक्स किरणों, पराबैंगनी दिखने लायक स्पेट्रोफोटोमीटर एवं स्पेट्रोप्लोटोवीटीर द्वारा अभिलक्षित किया गया । व्यावसायिक टायटेनिया की तुलना में नैनो टायटेनिया के एक्स किरण पीक अधिक चोड़े पाये गये । यही बात पराबैंगनी किरणों के अवशोषित होने वाले स्पेक्ट्रम द्वारा भी सही पायी गयी ।

बीटी कपास के बिनौलों में प्रोटीन व तेल की मात्रा का निर्धारण व अभिलक्षित करने के लिए F<sub>1</sub> एवं F<sub>2</sub> वंश के चालीस किलोग्राम बीटी कपास के बिनौलों का तेल की मात्रा के लिए मापन किया गया । सोलह नमूनों में प्रोटीन की मात्रा जानने के लिए भी आकलन किया गया । मूल्य संवर्धित कपास के उपोत्पादों के उपयोग परियोजना के अंतर्गत कपास डंठलों की एक आपूर्ति कड़ी की स्थापना की गई । कपास के डंठलों के खेतों में ही चलित कटाई वाली मशीन से काटने तत्पश्चात परिवहन द्वारा बोर्ड उद्योग में ले जाने की प्रक्रिया संभव एवं आर्थिक रूप से फायदेमंद पायी गयी । ओ.प्र.के. नागपुर में प्रदर्शनी हेतु 9 मिलीमीटर, 12 मिलीमीटर एवं 18 मिलीमीटर मोटाई के (4' X 3") चौड़ाई वाले कार्ड-बोर्ड तैयार किये गये ।

कपास के उपोत्पादों के मूल्य संवर्धन व व्यावसायिक तकनीकी विकास एवं सुधार हेतु कपास डंठलों के संघनन

मशीन की उत्पादन क्षमता का आकलन व सुधार किया गया। बंगाल देशी कपास के जलअवशोषक बनाने के लिए मानक स्थितियाँ पैदा की गयी। कपास के नमूनों का 48 घंटे कमरे के तापमान पर अवायवीय व फिर गर्म जल उपचार करने के बाद जलअवशोषक रुई बनायी गयी। उपभोक्ताओं की जरूरतों के अनुसार H<sub>2</sub>O<sub>2</sub> के द्वारा इनका विरंजन भी किया गया।

#### विस्तृत कार्यकलाप :

संस्थान, सिरकाट के निदेशक व वैज्ञानिक गण कपास परीक्षण एवं कपास के मानक बी.आई.एस. जैसे कई समितियों के सदस्य बनकर जाते रहे साथ ही ATIRA, BTRA, SITRA, UICT आदि के पैनलों में भी सम्मिलित रहे। इस वर्ष के दौरान संस्थान की मुख्य कार्यों का विवरण इस प्रकार है। (i) कपास के रेशों, धागों व वस्त्रों की गुणवत्ता मूल्यांकन की सटीक व विश्वसनीय डाटा की आपूर्ति, (ii) परामर्श सेवाएँ (iii) शोध परिणामों की वैज्ञानिक पत्रों, परिचायिकाओं एवं पुस्तकों आदि

का प्रकाशन ताकि संबंधित लोग इससे लाभान्वित हो सकें, (iv) प्रशिक्षण कार्यक्रमों द्वारा तकनीकी सूचना का विस्तार।

वर्ष के दौरान परीक्षण हाउस में 2870 कपास के नमूने रेशा, सूत एवं वस्त्र परीक्षण के लिए आये एवं 3100 नमूने क्षेत्रिय केन्द्रों पर प्राप्त किये गये। सिरकाट मुख्यालय में कपास की गुणवत्ता मूल्यांकन विषयों पर प्रशिक्षण पाठ्यक्रम आयोजित किये गये जिनमें वस्त्रोद्योग जगत के लगभग 62 प्रशिक्षणार्थियों ने भाग लिया। इन प्रशिक्षण कोर्स में HVI एवं AFIS संयंत्रों की जानकारी, प्रशिक्षित संबंधित लोगों को विशेष रूप से दी गई। ओ.प्र.के. नागपूर में लगभग 240 प्रायोजित लोगों को ओटाई के विभिन्न पहलूओं पर प्रशिक्षण दिये गये। संस्थान में विकसित तकनीकों को लोकप्रिय बनाने के लिए सिरकाट ने कई प्रदर्शनियों में भाग लिया। सिरकाट ने संसाधन विकास के तौर पर वर्ष 2007-08 के दौरान व्यावसायिक नमूनों के परीक्षण एवं प्रशिक्षण कार्यक्रमों द्वारा 66.43 लाख रुपये अर्जित किये।

## Salient Achievements at a Glance

### *Salient Research Achievements*

- Saw ginning has no effect on the strength, uniformity, elongation and micronaire value of cotton fibres provided their secondary cell wall development is optimum. An appropriate processing speed is found to be 750 rpm. There is no deterioration in fibre quality.
- Cotton samples stored for one month had maximum actinomycetes while fungal colonies were less.
- A lab model cyclone system has been designed for use in ginneries to reduce the respirable fraction of dust generated in gins. Fabrication of the machine is in progress.
- A software to develop a barcode technology for tagging cotton bales has been designed and developed.
- Stick band type cleaner developed earlier for cleaning seed cotton before ginning has been redesigned to remove the leaf trash effectively from mechanically picked cotton.
- During the year 2007-08, 6137 cotton samples received under AICCIP has been tested and reported.
- Seventy-three trade and 43 standard cotton varieties received during the current season have been evaluated.
- A new Lap preparation machine suitable for opening cotton samples weighing approximately 60 – 100 gms and converting them into a mini lap in about 15 minutes has been developed.
- Banana fibres can be spun on the jute spinning system to produce fabrics. Good quality paper can be produced from the scutcher waste.
- One hundred samples out of 970 cotton samples tested under TMC project on Quality Evaluation of Cotton Fibre were found to satisfy the fibre quality norms; 31 samples had even higher strength values than what is proposed as per length-strength norms.
- A durable and cost effective nanoparticle coating for paper has been developed. Coated paper samples showed excellent antifungal and antibacterial property.
- Nano silver imparted excellent antibacterial activity against *Staphylococcus aureus* and *Klebsiella pneumonia* when applied on cotton fabrics.
- It is possible to use HPTLC pattern as a marker for identification of chrysanthemum and marigold flowers.
- Crosslinking of cotton blended fabrics with polycarboxylic acid could be achieved with a lower material:liquor ratio without any adverse effect on the fabric properties. Crosslinked fabrics showed improved properties like stiffness and fullness though there was no significant difference in the softness of the fabric.
- Titania nanoparticles synthesized at CIRCOT was similar to commercially available titania.
- Cotton stalk supply chain has been established. Transportation of stalks in chipped form to a distance more than 50 km has been noted to be economical.
- Modification has been incorporated in the roller type cotton stalk compacting machine.



***Training, Consultancy and Technology Transfer Activities***

- About 2871 cotton samples at the headquarters and 3107 at regional units under the paid test category were tested and around 20.63 lakh generated.
- Fifty-eight personnel underwent training on quality evaluation of fibres and training on the use of HVI and AFIS and interpretation of results. Two hundred and forty personnel were trained in the operation of various ginning machines, their maintenance and on the importance of ginning for producing clean cotton. Rupees Five lakh twenty-six thousand and four hundred was generated.
- During the year, 325 containers of calibration Cotton were sold and a revenue of Rs. 2 lakhs generated.
- Eight consultancies were undertaken and a revenue of Rs. 13 lakhs generated.
- Four technologies viz. Double Roller Gin with Improved Power Transmission Mechanism for Roller and Beater, Hand-cum-Power Operated Cotton Stalk Compacting Machine, Miniature Spraying System for Cotton Seeds and a Machine for Compacting Cotton Stalk Using Hydraulic System were patented.

***Awareness Programmes, Participation in Exhibitions and Organising Seminars/Workshops***

- A National Seminar on Emerging Potential of Cottonseed and its By-products organised by CIRCOT in association with The Indian Society for Cotton Improvement was held on April 10, 2007. The Hon'ble Secretary, DARE and DG, ICAR inaugurated the seminar.
- The Third Review Meeting of the CFC funded project on Utilisation of Cotton Stalks for Value Added Products was held at GTC, Nagpur on May 25, 2007.
- ICAR foundation day was celebrated on July 16, 2007.
- A half-day stakeholders workshop under component 2 of NAIP on *A Value Chain for Cotton Fibre, Seed and Stalks : An Innovation for Higher Economic Returns to Farmers* was organised on July 20, 2007.
- A Hindi workshop was held on August 3 and 4, 2007 for the Technical Officers.
- Hindi day was celebrated from September 5 – 14, 2007.
- The communal harmony week was celebrated from November 19 – 25, 2007.
- NAIP launch workshop for the project *A Value Chain for Cotton Fibre, Seed and Stalks: An Innovation for Higher Economic Returns to Farmers and Allied Stake Holders* under Component 2 of National Agricultural Innovation Project held on January 9, 2008.
- A Review meeting of network project on Ramie was held at CIRCOT on February 25, 2008.
- National Science Day was celebrated on February 28.
- International Women's Day celebrated on March 8, 2007.
- Awareness Meet with textile personnel / entrepreneurs / industrialists / ginners / farmers to popularise various technologies developed by the Institute, proper methods of picking cotton, importance of clean cotton to earn premium prices, demonstration of cotton stalk collection, chipping, demonstration

of particle board preparation from cotton plant stalks were undertaken in the following places during the period.

GTC, Nagpur	April 28, 2007
Sirsa	November 21, 2007
Umri (Wagh)	November 24, 2007
Guntur	February 23, 2008
Udumalpet, Pollachi (T.N.)	March 5, 2008
Khadka (Jaipur) in Sailu Taluk, Wardha District	March 18, 2008

- Five lectures by the Institute scientists and three by specialists were arranged for the staff.
- The Institute participated in the following exhibitions.
  - AgroVision at Kasturchand Park, Nagpur from August 15 -18, 2007
  - Krishi 2007 at Nashik was organised by Media Exhibitors from November 29 – December 3, 2007.
  - Western Region Krishi Mela 2008 jointly organised by Sardarkrushinagar, Dantiwada Agricultural University, Deesa, Gujarat and Deptt. of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, New Delhi from March 15 – 18, 2008.

#### ***Accolades***

- Dr. N. Vigneshwaran, Scientist (Senior Scale) was awarded the YOUNG SCIENTIST AWARD - 2007 for his contribution in the field of microbial synthesis of nanoparticles and their application on cotton fabrics.
- Shri Chitranayak, Scientist (Senior Scale) bagged the 1st prize in Essay Competition and Dr. (Mrs.) Sudha Tiwari, T-6 received 3rd prize in the Hindi Sulekh Competition on January 10, 2008.
- Dr. (Mrs.) Sudha Tiwari, Technical Officer was awarded Rajbhasha Shree Puraskar for publishing research papers in Hindi and for being a recipient of various awards during the years 2002-07. She received 2nd Prize for a paper entitled “*Apashitya Eavam Akhadya Tel Se Vaiklpik Endhan*” on November 26, 2007 at New Delhi.

#### ***Budget Utilisation and Revenue Generation***

- Out of a sanctioned grant of Rs. 450 lakhs, an amount of Rs. 289.48 lakhs was utilised under plan scheme.
- During the year Rs. 66.63 lakhs has been generated as revenue.



## Introduction

This Eighty-Fourth Annual Report of the Central Institute for Research on Cotton Technology (CIRCOT) covers the period from April 1, 2007 to March 31, 2008.

CIRCOT was established in the year 1924 by the then **Indian Central Cotton Committee (ICCC)** under the name of **Technological Laboratory of ICCC**. The objectives initially were to undertake spinning tests on various cotton strains received from agricultural departments in the country and to assess their spinning value. These activities were carried out by the Institute in close co-ordination with the Departments of Agriculture of respective states and Agricultural Universities located in major cotton producing tracts in the country. After the abolition of commodity committees including the ICCC, the administrative control was transferred to the Indian Council of Agricultural Research (ICAR) and the name of the Institute was changed to **Cotton Technological Research Laboratory (CTRL)**. Since then the research activities have been reoriented and strengthened towards increasing the production and quality of cotton in the country. Research on better utilisation of cotton and cotton agro-wastes was recently accorded higher priority with a view to provide avenues for additional income to the grower and to promote self-employment opportunities among rural people.

Realising the phenomenal increase in the research component, the Quinquennial Review Team (QRT) recommended changing the name of CTRL to **Central Institute for Research on Cotton Technology (CIRCOT)** with effect from April 1, 1991.

### Mandate

- To develop new technologies and machinery for better utilization of cotton and other textile fibres by carrying out basic, applied, strategic and anticipatory research in post harvest technology.
- To extend effective technological support for improvement of quality of Indian cottons and cotton products.
- To act as nodal centre for diversified utilization of cotton plant by-products & processing waste and other crop residues.
- To provide services like training, education and consultancy to textile industry, Government and private agencies and to function as a referral laboratory for textile testing.

### Achievements Made in the Recent Past

- The commercial model DR gin has been suitably modified to delink both the beater and the roller to control their

speeds independently. This modified DR gin christened as **Variable Speed DR Gin** could be used to make cotton staple specific adjustments in the speeds of both beater and roller to enhance the output from the conventional 45 kg to 60 – 80 kg of lint per hour without any additional demand on power.

- The commercial DR gin has also been modified to overcome the requirement of more oil and grease by incorporating an entirely different transmission system. This machine is 30% energy conserving and 70% more productive than the older version.
- A Hipro Laboratory Model DR Gin to gin large quantity of seed cotton samples quickly for their fibre and seed quality has been jointly developed in collaboration with Visvesvaraya National Institute of Technology (VNIT), Nagpur. This machine has the advantage of working on a single phase supply with either a 2 hp or a 3 hp motor. This machine can process about 50 – 60 kg seed cotton /hour.
- A detailed manual has been brought out on trouble shooting and its redressal on the various problems faced by the ginners regarding ginning and maintenance of various machinery after a detailed on-the-spot study of several modernized ginneries in Maharashtra. This manual will be the first of its kind for the ginning sector. It deals with the details of the different machines such as seed cotton conveying systems, precleaners, seed cotton distribution systems, Auto feeders and DR gin, Saw gin, Lint conveying systems, Lint cleaner, Cotton conveying systems, Bale press and also possible breakdown and their solutions. Also several useful tips for conditioning of raw materials and on the safe and healthy practices for workers attached to ginneries are presented. It is hoped that this manual would fulfill the longstanding demand of the ginners and would serve as a dictionary for safe running and maintenance of different installations in the ginnery.
- Three different types of Cotton Stalk Compacting Machines *viz.* hand operated, power operated, hydraulic and roller type have been designed, fabricated and performance evaluation has been carried out.
- A Database Management System for Running a Modernised Ginnery has been designed and developed for realising enhanced efficiency of performance. This user friendly database helps the ginning personnel to track down various details about infrastructure, kapas, bale, seed, ginning, maintenance of various machinery, personnel, financial and transaction details, etc. It is also possible to generate reports for any query.
- To circumvent the problem posed by chromium contamination due to the use of conventional fabric roller that contains chromium, a rubber and fabric

## INTRODUCTION

based roller for double roller gin has been developed. No significant difference in fibre quality was noted due to the use of this rubber roller.

- After conducting a survey on fully automatic, semi automatic and conventional Indian ginneries, recommendations have been made for reducing noise levels in ginneries through the use of plugs or muffs and respirable dust masks for the workers to avoid entry of respirable cotton dust from the air to workers that cause bysinosis, a respiratory disorder.
- An Energy Audit has been carried out in the ginnery to find out the energy utilized in various process and also that consumed while running various machines. Recommendations have been made to reduce the energy spent in many of the operations. These steps would go a long way in conserving electricity that would make the ginning process a profitable vocation.
- Cost involved in various ginning operations for processing cotton has been arrived at through a survey of modernized ginning industries. In all, the expenditure on electricity has been noted to be the key factor that accounts for about 45% of the processing cost; then comes the bale ties (30%), salary towards gin labour and staff (17%), repairs, maintenance and miscellaneous expenses (4%). The study also has made recommendations in certain key areas for conservation of energy and other outputs so that the overall processing cost comes down.
- CIRCOT in collaboration with M/s. Cottor Plants, Mumbai has designed and fabricated a prototype model of an improved 45 saw ginning machine. This model has, apart from provision for regulating feeding rate, necessary controls for saw speeds to be optimized depending on the staple grade. The installation of the machine has been completed and trials are underway.
- CIRCOT has been associated with the AICCIP from its inception for evaluating fibre quality and spinning parameters of a number of cotton varieties / hybrids every year and has been communicating to the breeders about whether the newly developed strains are *on par* or better than the ones used as checks in the programme. CIRCOT's intervention in terms of technological inputs has helped the breeders in reorienting their research and has enabled release of varieties that possess fibre properties acceptable to the industry. The Institute through surveys also finds out the projected requirement of cotton and advises the breeders who in turn reorient their breeding programmes.
- An index to evaluate nepping potential in terms of maturity of fibres has been developed at the Institute. Using this index it is possible to predict the nepping tendency of the fibres during processing.
- Through a Revolving Fund project from ICAR, the institute started producing Standard reference material *viz.*

- Calibration Cotton standards for calibrating HVI instruments used in testing cotton fibres after USDA stopped the sale of this reference material for HVI in ICC mode. This effort was to preserve the precious foreign exchange apart from producing standard reference material for the Indian textile industry *on par* with the international standards but at a much cheaper rate. In the last five years 4186 containers were sold earning a revenue of Rs. 26,29,035.
- The institute successfully blended Avivastra wool with DCH.32 cotton for processing both on ring and rotor spinning system. Full-scale spinning trials of the optimised blends carried out on commercial spinning machines were successful. About 150 metres of fabric with a width of 1.3 metres were produced on a powerloom. A few metres of the above grey fabric samples were processed at a reputed woollen mill for evaluation and the results have been encouraging.
  - Attempts to blend Angora rabbit hair with Suvin and DCH.32 cottons for spinning 40s yarns suitable for knitting were successful at the Institute. The performance of the yarn produced from the blend was satisfactory. Knitted fabric produced from the blend of cotton, rabbit hair and polyester fibres with equal proportions had better bursting strength and low shrinkage properties.
  - CIRCOT has successfully processed cotton:ramie blend in the cotton system to produce 40s Ne ring yarn with a blend ratio of 65:35, using chemically degummed ramie.
  - Modification has been made in Raspador fibre extractor to suit extraction of fibres from banana pseudostem. Also, a fibre cleaner has been developed to remove non-fibrous material from the fibres extracted using the modified Raspador. These two in combination give fibres which are as good as hand extracted material as far as mechanical properties are concerned. They have better whiteness index, soft silky feel with silvery appearance. More than 5 kg of fibres could be extracted in 8 hours by the modified machine. A patent has been filed.
  - The institute has developed a village level sliver making machine with which the villagers could make better slivers for further processing them into yarns at the village itself. Since the sliver making is made through a machine, there is no damage to the fibres unlike in the traditional method where crude comb bars are used for opening cotton, which results in fibre damage and production of poorer quality yarn. The machine consists of three detachable units – pre-opening, carding and sliver winding units. The pre-opening and sliver winding units are optional and can be engaged or removed as per requirement. The pre-opening unit is to be employed for better opening of cotton and for enabling a regular feed of the card. The

## INTRODUCTION

sliver winding unit is for winding the sliver in a spool for proper transportation to the next machine.

- A new bio-scouring technique employing a mixed microflora has been developed at CIRCOT which saves energy by 30% and is relatively a "green" technology with 25% reduction in the pollution load.
- Under a UNDP sponsored programme, CIRCOT has successfully developed and standardised dye extraction and application techniques in respect of 110 dye yielding plants. Thirty-six plants have been identified for large scale cultivation. CIRCOT was also identified as a lead Institute under NATP programme with a mandate to develop extraction and application techniques for dyes isolated from Safflower. Two dyes have been isolated and application techniques on cotton have also been standardised. Under the above programme, methods have been developed to obtain the dye in a powder form as well.
- A simpler, faster, less expensive and eco-friendly process for degumming ramie fibres by anaerobic retting has been developed. About 35% degummed ramie fibres could be blended with cotton, while this could be increased to 50% while blending with polyester.
- The Institute has developed an energy conserving enzymatic bioscouring technique using pectinase enzyme to prepare absorbent cotton from Bengal *desi* cotton. Absorbent cotton prepared by this method is similar in properties with the commercially available product. Efforts are on to up-scale this process.
- Techno-economic feasibility of particle board preparation from cotton stalks has been established through a large scale trial. These particle boards have been used in panelling a few rooms in the institute from floor to ceiling. Also, the Committee Room and DG's visitors room at ICAR headquarters in Delhi have also been panelled with particle boards.
- CIRCOT has developed a method for increasing the crude protein and digestibility of cottonseed hull by an inexpensive anaerobic treatment. Trials undertaken on 500 kg batch treatment indicated that the crude protein percentage goes upto 7.7 from an initial value of 3.6 and the digestibility from 50 to 60. This treatment imparts a characteristic aroma acceptable to cattle. The technology is viable and feasible and perhaps even other non-conventional feed materials can also be treated to make them acceptable to cattle.
- The Institute has demonstrated that cellulose powder could be prepared from coir waste (cut fibres) and binderless boards from coir pith. Isolation of lignin from coir waste has also been demonstrated.
- The feasibility of removing residual oil from the oil palm fibres by a biological treatment has been demonstrated. This enables the utilisation of these fibres for different end uses.



- With funding from Common Fund for Commodities (CFC), Netherlands and with the support of the International Cotton Advisory Committee (ICAC), Washington, a one tonne per day (1 TPD) automatic particle board plant using indigenous machinery has been installed at the Ginning Training Centre of CIRCOT, Nagpur. Three layered particle boards of 4' x 3' size are being prepared in this plant. By supplying cotton stalks for board industry, a farmer can earn Rs. 500 per tonne. If the stalks are supplied to the industry in a cleaned chipped readily usable form as much as Rs. 1500 to 2000 per tonne could be earned by the farming community. The objective of this internationally funded programme is to demonstrate the feasibility of using cotton stalks as raw material for board manufacture in order to attract prospective entrepreneurs, generate additional income for the farmers, and for creating employment potential in the rural areas.
- By utilizing the state-of-the art laboratory facilities at CIRCOT, it is possible to carry out over 150 tests pertaining to quality of different textile materials. The Eco-testing laboratory at CIRCOT is well equipped to carry out testing on textile materials for all the prescribed eco-parameters such as detection and estimation of banned aromatic amines, pentachlorophenol (PCP), banned pesticides, toxic metals, free formaldehyde and halogenic carriers. These facilities are open to all the textile mills, government departments and marketing organisations both in the private and public sector.
- CIRCOT is the only ICAR Institute to get involved in all the four Mini Missions under the Technology Mission on Cotton by the Government of India to enhance production, productivity and quality of cotton in the country.
- National Agricultural Technology Project (NATP) funded by the World Bank has recognised CIRCOT as a Referral laboratory for Cotton Textiles, an unique recognition for the Institute. This enabled the Institute to procure a number of hi-tech instruments with the funds provided under this project.
- Around 5978 commercial samples of fibre, yarn and fabric were tested at the Headquarters and Regional Units during 2007-2008.
- Every year, training is imparted both at the Headquarters and at the Ginning Training Centre, Nagpur for personnel sponsored from the trade and textile industry and also from the ginning sector. At the Headquarters training is imparted on various test methods on fibres, yarns and fabric apart from practical training in the operation of various testing equipment. Interpretation of test results also forms a part of the training programme. At GTC, Nagpur, various aspects such as maintenance of ginning machines and

## INTRODUCTION

their operations, importance of producing clean cotton are dealt with in the training module.

- During 2007-2008, 58 personnel were trained at the Headquarters. At the Ginning Training Centre, Nagpur 240 candidates were given training on various aspects of ginning and material handling.

### Awareness Meets

- An awareness meet was held at GTC, Nagpur on April 28, 2007 for demonstrating the preparation of particle board. During this meet, a software prepared for maintenance of the ginning industry was presented by Smt. Acushla Antony.
- An awareness meet on the demonstration of cotton stalk collection and chipping was arranged at Sirsa on November 21, 2007.
- At the awareness meet at Umri (Wagh) on November 24, 2007 in which around 75 farmers participated; importance of cotton stalks, clean picking of cotton, ginning were told to the farmers followed by a demonstration of particle board preparation.
- An awareness meet on ginning and demonstration of particle board preparation from cotton plant was organised at Guntur on February 23, 2008.
- At the awareness meet at Udumalpet near Pollachi (Tamil Nadu) on March 5, 2008 emphasis was made on the importance of certified seeds,

agricultural and agronomic practices, importance of clean cotton picking, on-farm storage of cotton stalks, transportation and use of cotton stalk for value added products to get additional income to the farmers.

- An awareness meet on clean cotton picking and demonstration to the farmers on uprooting and chipping of cotton stalk at Khadka (Jaipur) in Sailu Taluk, Wardha District was held on March 18, 2008.

### Participation in Exhibition

- AgroVision at Kasturchand, Nagpur from August 15 -18, 2008.
- "Krishi 2007" at Nashik organised by Media Exhibitors from November 29 – December 3, 2007.
- "Western Region Krishi Mela 2008" jointly organised by Sardarkrushinagar, Dantiwada Agricultural University, Deesa, Gujarat and Deptt. of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, New Delhi from March 15 – 18, 2008.

### Patents Applied / Granted Recently

- Biochemical Method of Deinking Newspaper Waste (2004)
- Biochemical Scouring Technique for Cotton (2004)
- Multilayered Particle Boards from Cotton Plant Stalks (2004)
- Biological Method of Preparing Binderless Boards (2004)

- Hand-cum-Power Operated Cotton Stalks Compacting Machine (2004)
- Cotton Stalks Compacting Machine using Hydraulic System (2004)
- Miniature Spraying System for Cotton Seeds (2004)
- A Process for Production of Silver Nanoparticles using the Fungus *Pleurotus sajor caju* (2005)
- Development and Use of Rubber Disk with Soft Rubber Layer as Material for Self Grooving Roller (2005)
- Sliver Making Machine (2007)
- M/s. Punjab Durrie Weavers, Chandigarh for working on the development and use of natural dyes in textiles.
- M/s. Precision Tooling Engineers, Nagpur for Hydraulic Cotton Plant Stalk Compacting Machine
- M/s. Precision Tooling Engineers, Nagpur for commercial manufacture of HIPRO DR Gins.
- Government of Meghalaya, Shillong for Biological Degumming of Decorticated Ramie Fibres
- M/s. Renaissance Paper Mill Ltd., Nagaland for preparation of paper from bamboo and other biomass grown in the northeastern region of India

In the recent past, the following **MOUs were signed** by the Director, CIRCOT :

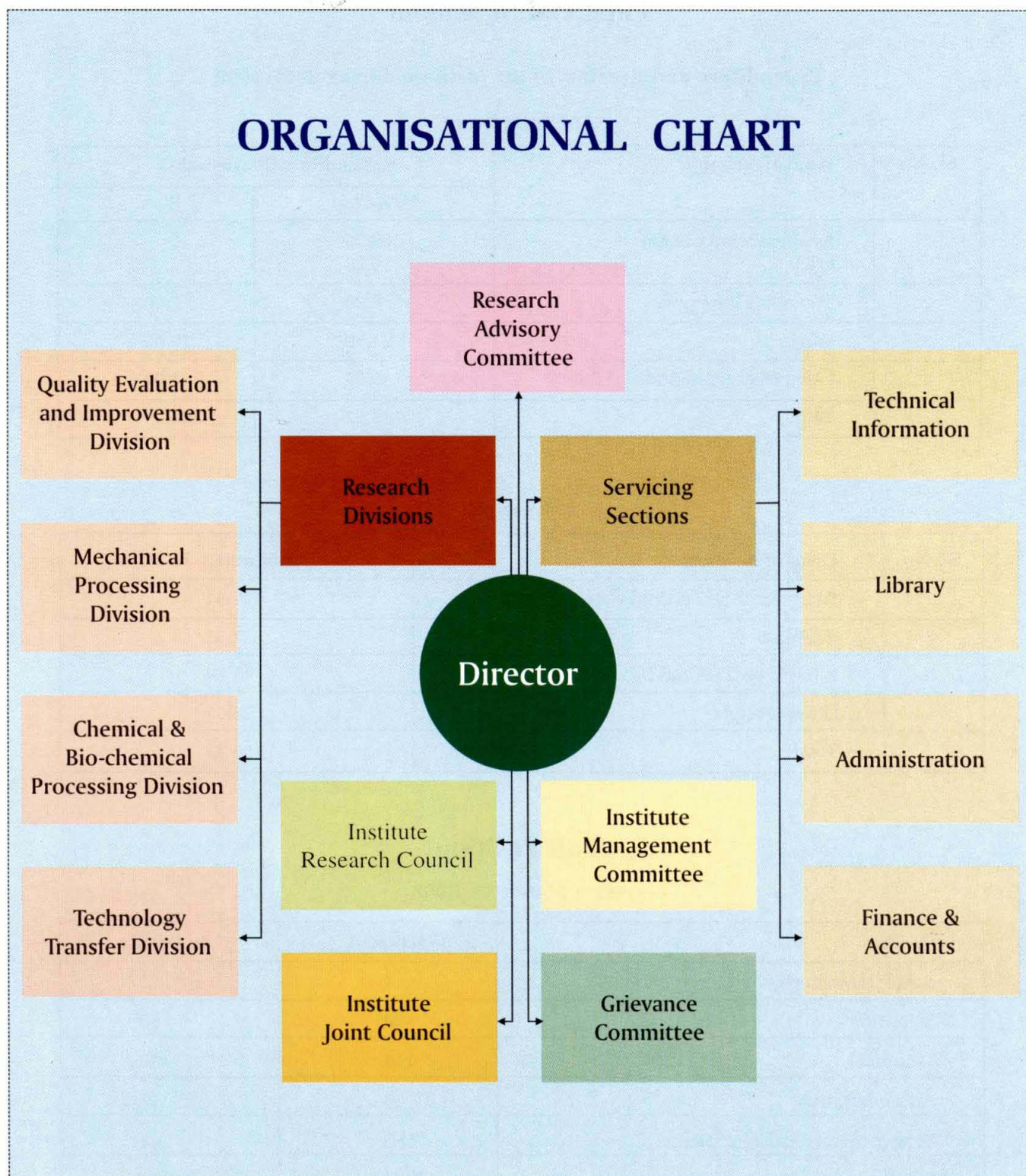
- M/s. Bajaj Steel Industries, Nagpur for the fabrication and marketing of Improved Auto feeder, Precleaner and Post-cleaner connected with the ginning process.
- M/s. U.D. Patel and Co., Mumbai for large scale manufacture and marketing of CIRCOT Variable Speed DR Gins for increasing gin productivity.
- M/s. Precision Tooling Engineers, Nagpur for manufacturing and marketing of Lilliput Gin for ginning small seed cotton samples.
- M/s. Trytex Machine Co., Coimbatore for manufacture of a Miniature Spinning System, the know-how for which was supplied by CIRCOT.

#### **Revenue Generation:**

During the current year an amount of Rs. 66.43 lakh was generated as revenue through commercial testing, training and consultancy activities.

**Organisation** : The Director heads the Institute with active help from a team of senior scientists and technical officers. An Administrative Officer provides him assistance in the general administration, while the Finance and Accounts Officer looks after matters concerned with accounts and audit of this Institute (Annexure I).

# ORGANISATIONAL CHART



## Financial Statement

### Expenditure and Receipts of the Institute during 2007-2008

#### A. Expenditure

Sl. No.	Head of Account	Expenditure (Rs. in lakhs)	
		Non-Plan	Plan
1.	Establishment Charges OTA	569.20 0.23	– –
2.	Travelling Expenses	6.99	7.00
3.	Works	24.50	10.00
4.	Other Charges including Library	115.05	165.90
	<b>Total</b>	715.97	182.90

#### B. Receipts

Sl. No.	Head of Account	Amount (Rs. in lakhs)
1.	Analytical and Testing Fees	19.91
2.	Training	11.37
3.	Interest on TDR & STD	11.58
4.	Other receipts	23.57
	<b>Total</b>	66.43

## Staff Position

As on March 31, 2008

Cadre	Sanctioned	In Position
R.M.P. (Director)	1	1
Scientific	50	30
Technical	114	108
Administrative	48	47
Supporting + Canteen Staff	66	63
<b>Total</b>	<b>279</b>	<b>249</b>

## 2

### Research Achievements

A brief account of the Progress made in various research projects carried out during 2007–2008 at the headquarters and its various regional stations including the Ginning Training Centre, Nagpur is given below:

#### **CORE AREA I : IMPROVEMENT IN GINNING OF COTTON**

##### ***Design and Development of Prototype Variable Speed Saw Gin***

During reported period, a full scale evaluation was made to compare the effects of roller ginning and saw ginning on the fibre and yarn properties for five cotton cultivars. In addition to the productivity estimation of saw machine, the performance of air jet cleaner and pre-cleaner machine was also evaluated.

The productivity of saw ginning machine was found to vary from 180 kg/h to 400 kg/h seed cotton for all cotton cultivars at processing speeds varying from 450 rpm to 850 rpm. The productivity of saw gin was found almost same at processing speed varying from 650 to 850 rpm. It was mainly due to the reason that whenever the feeding rate was increased, the machine was getting struck as it is not designed for ginning more than 400 kg seed cotton per hour. But the

productivity of saw gin was around 50% lesser in case of processing speeds lower than 650 rpm. The processing speed of 750 rpm was found to be optimum.

It was found that, the type of ginning per se had no appreciable effect on the strength, uniformity, elongation, Micronaire value and neps of cotton fibre. It was noted that the 2.5% span length in case of saw ginning was lesser by 0.5 to 1.0 mm than DR ginned cotton in case of Bunny cotton. In case of cotton cultivar C belonging to the long category, within the limits of study, the 2.5% span length was found to be the same for fibres obtained from both saw gin and DR gin. It was noted that the strength and Micronaire value were around 50% and 40% more in case of cotton C than other cultivars. It is felt that the well developed cotton fibres of cultivar C would have withstood the pulls and pressures of saw ginning effectively to realize optimum fibre parameters.

The cleaning efficiency of air jet cleaner machine was found to vary from 7.8 to 11.2%, 19.8 to 24%, 7.1 to 13.6% and 12.9 to 14.1% for cotton cultivars viz. Bunny, trade variety, MCU.5 and Rasi respectively at different processing speeds. The efficiency of machine was noted to be higher at lower speeds. The pre cleaning machine was found to remove trash to the extent from 15% to 17.1%, in all cotton cultivars tested.

### ***Development of Techno-economically Viable Cottonseed Delinting Process to Recover Linters***

At present, linters are extracted by saw type delinter. Attempt was made to extract linters by double roller (DR) gin which is extensively used for ginning cotton in India. This study was intended to (1) measure the power requirement for extracting linters both by saw type delinter and double roller (DR) gin and (2) assess the properties of linters, and paper prepared from linters. The cleaned cottonseed (DR ginned) was used for the delinting trials on the saw type delinter and roller gin. Microcontroller and PC based experimental setup was specially designed to measure the power requirement in both the machines. Experiments were conducted in a completely randomized design replicated two times. It was observed that the average linter recovery, processing capacity and power requirement (for extracting 100 kg linters) on saw type delinter & DR gin were

found to be 4.86% and 0.85%, 307 and 301 Kg cottonseed/h, 67.5 and 111 Kwh respectively.

It was observed that in case of DR gin, the linter recovery was 15.8% higher than the saw type delinter (76.83%) and found to be 89.03%. The cleaned linter samples were kieran with 3% NaOH in an autoclave for 3 hours and washed thoroughly to convert these into pulp. Pulp samples were bleached using hypochlorite 4% for 2 hours at room temperature. Air dried bleached and unbleached linter samples were beaten in a valley beater upto  $300 \pm 25$  CSF and sheets of  $60 \pm 2$  GSM were prepared. Details of the properties of the paper made from the samples are given in Table 1.

### ***Influence of Storing Conditions on Bale Quality***

The prime objective of this project was to find out the effect of long time storing of cotton bales on the quality characteristics.

TABLE 1 : PROPERTIES OF PAPER PREPARED FROM LINTERS OBTAINED BY SAW TYPE DELINTER AND DR GIN

Properties	Saw type delinter		DR Gin	
	<i>Unbleached</i>	<i>Bleached</i>	<i>Unbleached</i>	<i>Bleached</i>
GSM (g/m <sup>2</sup> )	60±2	60±2	60±2	60±2
Burst Factor (kg/cm <sup>2</sup> )	13.3	10.0	18.3	16.7
Tear Factor (mN.m <sup>2</sup> /g)	190.4	197.0	278.8	210.8
Breaking Length (meter)	1263	1094	2513	1925
Double Folds (No.)	5	2	20	11
Brightness (%)	48.6	74.6	60.8	78.5

During the reported period 50 quintals seed cotton of three cultivars namely MCU.5, Bunny and LRA.5166 were processed and three bales each from first two cultivars and 4 bales of LRA.5166 were made at GTC, Nagpur. The samples were drawn from each cultivar before formation of bales for determination of moisture content, fibre properties and microbial load. The observations were recorded for the quality assessment, colour and the microbial degradations. After 30 days again one bale from each variety was opened and the samples were drawn from different layers of the bale. The layers are marked, (0) surface (1) 9 inch below from surface, (2) centre of the bale (3) 9 inch from other side of the bale.

The fibre attributes whiteness index and microbial load at the time of formation of bales were measured. The salient findings are:

The whiteness grades were noted to be 67.0, 63.6 and 62.8 for MCU.5, Bunny and Ankur.651 varieties, respectively. The yellowness grades were 9.3, 9.0 and 9.0 for MCU.5, Bunny and Ankur.651 varieties, respectively. The colour grades noted were 52-1, 52-2 and 52-2 for MCU.5, Bunny and Ankur.651 varieties, respectively. The fibre samples were analyzed for the presence of bacteria, fungi, yeast, and actinomycetes using different media. The results showed that actinomycetes count was maximum while fungal colonies observed were lesser in number in the samples of MCU.5 and Bunny cotton. The work is in the progress in studying the cellulytic micro organisms present in the above microflora.

### ***The Performance Evaluation of Cyclones used in Modern Ginneries***

Cyclones are collectors for large gin trash and finely divided dust (particles smaller than 100  $\mu\text{m}$ ) from the ginneries. They are a cost effective means of treating air released by cotton gins. Hence it is essential to assess the performance characteristics of cyclones used in ginneries to suggest some remedial measures to manufacturers and ginners to bring down the dust emission in modern Indian ginneries.

During the reported period, dust concentrations at different processing stations in three modernized ginneries were determined with the use of Haz Dust Monitor (EPAM-5000) instrument. The dust concentration at PM2.5 and PM10.0 levels were recorded at pre-cleaner, gin house, lint cleaner, pala hall and press house. The average dust concentrations at PM2.5 and PM10.0 levels were recorded in the range of 120 to 200  $\mu\text{g}/\text{m}^3$  and 200 to 560  $\mu\text{g}/\text{m}^3$ , at different processing stations in modern ginneries whereas, the permissible dust concentration levels as prescribed by EPA are 15  $\mu\text{g}/\text{m}^3$  and 50  $\mu\text{g}/\text{m}^3$  at PM 2.5 and PM10.0, respectively. The maximum dust concentration levels were recorded at pre-cleaner in case of both PM2.5 and PM10.0.

A lab model cyclone system has been designed to evaluate the performance and optimize the different parameters (i.e. inlet air velocity, pressure drop, efficiency, etc.) of 1D2D and 1D3D cyclones. The lab model cyclone system consists of 1D2D and 1D3D cyclones of 600 mm diameter, rotary lock system for dust regulation, fan, collection



chamber and ducting. The fabrication of the system is under progress.

### ***Design and Development of Barcode Technology for Tagging Cotton Bales***

The bale marking system currently employed and methodology for bale record keeping adopted by Indian ginneries were assessed. The Indian standards for the cotton bales were also studied and the drawbacks in the present marking system were noted. It was found that application of customized barcode as bale tags for identification of bales would be a good alternative to the present marking system.

A Software to generate customized barcode labels for identification of every individual cotton bale is being developed using barcode fonts and visual basic programming language. Designed labels can accommodate textual information on bales viz., lot no, year of production and name of ginning factory along with bale ID in the form of alphanumeric barcodes. Preliminary version of labeling software has been developed which is to be revised as per the requirement of present bale marking system. Designed labels will be used for bale marking in the ginning factories after baling operation.

Also a software is under development to read the bale bar-coded IDs with the help of barcode scanner. A database application in visual basic programming language is under development to interface and access bale bar-coded IDs. A program is also being developed for record keeping of bales in a ginning factory. Information on bales, *i.e.* name of ginning factory, year of production,

lot no, press mark no, bale weight, grade, variety will be available at finger tips after scanning the bar-coded label. The additional information such as fibre qualities of bales *i.e.* staple length, Micronaire, strength, uniformity ratio, tenacity and colour would be incorporated in the database against the bale ID to help in marketing of bales. Bar-coded IDs can be accessed using a barcode scanner interfaced to computer. Designed software will open the record for the bale if information has been already entered for that ID. User can enter records for new bale IDs. Also the designed database application will have added functionalities of record keeping, querying and report generation.

### **EXTERNALLY AIDED PROJECT**

#### ***Development and Evaluation of Cleaning Machinery for Mechanically Picked Seed Cotton***

Earlier under the National Agricultural Technology Project (NATP), a stick machine and saw band type cleaner were developed for cleaning the mechanically picked seed cotton before ginning. The overall performance of the developed machines was satisfactory, as stick removal efficiency and fine trash removal efficiency were found to be 87 & 49 percent respectively. However, although the lint cleaners presently available are efficiently removing the cut seeds, short fibres, motes, soil particles, they do not remove the leaf trash effectively in view of more leafy trash in machine picked cotton. Hence it is necessary to design a machine that can remove the leafy trash effectively.

Therefore, the work of development of

## RESEARCH ACHIEVEMENTS

a lint cleaner for the mechanically picked cotton has been undertaken recently under the project entitled *Mechanization of Cotton*

*Production TMC MMI (2.3)*. The changes to be incorporated in the existing lint cleaner are presented in Table 2.

TABLE 2: CHANGES TO BE INCORPORATED IN THE EXISTING LINT CLEANER

S. No	Parameter	At Present	Proposed
1	Cleaning tip design	Metal Spade. Rectangular tip.	Circular Spike – Rounded Edge
2	Cleaning tip height	100 mm	140 mm
3	Pipe OD	250 mm	165 mm
4	Roller OD	450 mm	445 mm
5	Roller RPM	296 rpm for all 3 rollers	296 rpm – Roll 1 395 rpm – Roll 2 475 rpm – Roll 3
6	Grid bars	Mild Steel standard Flat	Aluminum Tapered flat
7	Grid bar spacing	Fixed	To be made adjustable
8	Grid bar to roller tip gap	Fixed – 25 mm	To be adjustable from 15 to 25 mm

### CORE AREA II : IMPROVEMENT AND QUALITY EVALUATION OF FIBRE, YARN AND FABRIC

**This core area encompasses three distinct facets of technological research:**

- a) Evaluation of the quality of cotton samples received from agricultural trials and the All India Co-ordinated Cotton Improvement Project (AICCIP).
- b) Tests on Standard and Trade varieties of Indian cottons.
- c) Research work done on specific agricultural and technological aspects relevant to improvement of cotton attributes.

#### *a) Evaluation of the Quality of Cotton Samples under the All India Co-ordinated Cotton Improvement Project*

The All India Coordinated Cotton Improvement Project (AICCIP) was launched in April 1967 with a view to improve cotton productivity and quality through coordination of research efforts at various Institutes, Agricultural Universities, State Departments of Agriculture and other related agencies. CIRCOT is primarily involved in research pertaining to quality evaluation of cotton lint, its mechanical behaviour at various stages of processing upto spinning of yarn and evaluation of its characteristics.

The regional stations of CIRCOT in the cotton growing areas participate in quality evaluation of cotton strains developed and tested under the AICCIP. In general, screening of initial breeding material, cotton germplasm, are tested for quality parameters at the regional units of CIRCOT. Most of the cottons under National Trials are tested at regional unit Nagpur. Advanced trials for testing of microspinning and full spinning and mill processing are being carried out at Headquarters, Mumbai. For the last four years fibre samples pertaining to Bt. Cotton trials conducted under AICCIP are tested at Headquarters, Mumbai. Further, monitoring of various quality parameters, collection of data and finalization of reports are exclusively carried out at CIRCOT Headquarters, Mumbai.

Breeding materials, Initial Evaluation Trials (IET) and Preliminary Varietal Trials (PVT) constitute the initial stages of cotton breeding programme of AICCIP. Promising strains amongst these trials are taken under Coordinated Varietal Trial (CVT) called Advanced trials. The samples under IET or PVT are tested only for fibre quality parameters by using the High Volume Instrument (HVI) whereas, samples of CVT are evaluated for spinning tests and seed coat fragments, trash content, yarn uniformity besides fibre parameters. Finally, before releasing the cotton variety/hybrid for commercial cultivation, its full spinning potential is checked. This is to ensure its acceptance by textile industry once it is

released and cultivated on a large scale in farmer's field.

Cotton cultivation in India is carried out under three prominent zones. These are as follows:

Zone	States
North	Punjab, Haryana, Rajasthan, Uttar Pradesh and New Delhi
Central	Madhya Pradesh, Maharashtra, Gujarat and Orissa
South	Andhra Pradesh, Karnataka and Tamil Nadu

A large number of cotton samples are received every year for quality evaluation from trials conducted under AICCIP by Agricultural Universities and private participants. The number of samples received during 2007 -2008 season for different tests from agricultural trials at the Headquarters, Mumbai is given in Table 3 and those tested at each of the regional units of CIRCOT are presented in Table 4. The number of cotton samples received from different states and tested at CIRCOT under AICCIP for various quality parameters is given in Table 5.

The following abstracts related to forty-first Annual Report, summarises the test results of 6409 lint samples and their spinning performance including yarn quality analysis for cotton season 2006-2007.

RESEARCH ACHIEVEMENTS

TABLE 3 : NUMBER OF COTTON SAMPLES RECEIVED AT CIRCOT HEADQUARTERS FROM AGRICULTURAL TRIALS DURING X AND XI PLAN

Type of Tests	Average for the X plan (2002-03 to 2006-07)	XI Plan 2007-2008
Fibre and full spinning	59	16
Fibre and Microspinning	442	308
Fibre Test alone	3323	2138
Mill Test	8	–
Standard Cotton	47	40
Trade Varieties	42	20
Germplasm	913	450
Research	61	173
Consultancy Projects	–	137
<b>Total</b>	<b>4895</b>	<b>3282</b>

TABLE 4 : NUMBER OF COTTON SAMPLES TESTED AT THE REGIONAL QUALITY EVALUATION UNITS DURING 2007-2008

Regional Unit	No. of Sample Tested
Coimbatore	9910
Dharwad	1812
Surat	7435
GTC, Nagpur	5020
Sirsa	3915

TABLE 5 : STATE-WISE NUMBER OF COTTON SAMPLES TESTED AT CIRCOT UNDER AICCIP DURING 2007-2008 SEASON

State	Fibre and full spinning	Fibre and microspinning	HVI alone	Total
Punjab	–	65 (7)	638 (39)	703 (46)
Haryana	4 (1)	48 (4)	354 (19)	406 (24)
Rajasthan	–	–	399 (22)	399 (22)
Uttar Pradesh	–	–	128 (7)	128 (7)
Gujarat	–	–	676 (49)	676 (49)
Maharashtra	5 (4)	47 (4)	1548 (89)	1600 (97)
Madhya Pradesh	–	14 (1)	428 (24)	442 (25)
Orissa	–	–	267 (12)	267 (12)
Karnataka	1 (1)	43 (4)	603 (31)	647 (36)
Andhra Pradesh	1 (1)	–	376 (25)	377 (26)
Tamil Nadu	5 (2)	69 (5)	418 (22)	492 (29)
<b>Total</b>	<b>16 (9)</b>	<b>286 (25)</b>	<b>5835 (339)</b>	<b>6137 (373)</b>

Note : The numbers in bracket shows the reports issued.

## NORTH ZONE

**1. *G. hirsutum* Trials**

*Preliminary Varietal Trial (PVT) Br.03:* The trials were conducted at seven locations. On an average the 2.5% span length value was 26.0 mm, Micronaire around 4.5 and bundle tenacity around 21.0 g/t and they were nearly same at all locations. These samples could be spun to 30s count. On the basis of fibre quality norms the strains H.1246, H.1282, F.2089, CSH.3118, H.1287 were found promising at many locations.

*Coordinated Varietal Trial (CVT) Br.04 :* The trials conducted at seven locations yielded values of 2.5% span length, Micronaire and bundle tenacity around 25.0 mm, 4.2 and 21.0 g/t respectively. However, the samples from Ludhiana and Sriganagar were finer as compared to those from other locations whereas, samples from Hisar and Sirsa displayed lower strength value (18.5 g/t). The strains F.2036, LH.1995, CSH.7106 fared well at 30s count. The strain CSH.7106 showed good fibre quality at five locations. However, none of the strains from Hissar and Kanpur was found promising.

*Intra-hirsutum Hybrid Test Br.05 :* This trial was conducted at seven locations. In general, the 2.5% span length, Micronaire and bundle tenacity values were found to be 26.0 mm, 4.8, and 20.0 g/t respectively. Considerable difference in fibre properties was observed with respect to location. The samples from Bhatinda were of shorter staple (20.0 mm), very coarse (6.7) possessing very low strength (14.4 g/t). Comparatively the samples from Kanpur and Sriganagar

centres gave good combination of fibre properties. The strains HHH.395, USHH.11, FHH.136, HHH.386 and MRC.2329 gave good CSP at 20s count. The strain HHH.395 was found promising even at 30s count. None of the strains from Bhatinda and Hisar centres was worth promotion.

**2. *G. arboreum* Trials**

*Coordinated Varietal Trial Br.24:* This trial was conducted at eight locations. Most of the strains from all locations were of shorter staple (19.5mm), very coarse (6.6) having very low strength of 16.0 g/t. Due to poorer quality, these samples could not be spun even to 20s count. They need improvement in all the three major fibre attributes. However, the strains RG.405, RG.396 and CISA.410 were slightly superior in quality amongst the lot.

*Desi Hybrid Trial Br.25 :* These trials were conducted at six locations. Most of the samples possessed very poor fibre attributes at all locations. The values of 2.5% span length, Micronaire and bundle tenacity were found to be 20.0 mm, 6.7 and 17.0 g/t respectively. None of the sample was found promising. Though a few samples were tried for spinning, due to very low quality they could not be processed. However, the strains CISAA.7, RSJDH.231, AAH.21, USDH.505 and AAH.22, gave comparatively good strength values amongst the lot.

**3. *ICAR Bt. Cotton Hybrid Trials:***

Under this trial there were two different types *viz.* I year and II year trial. Under I year category 22 cotton hybrids were grown

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while under II year category 5 cotton hybrids were grown at five locations. In general, the values of 2.5% span length, Micronaire and bundle tenacity were 25.0 mm, 4.5 and 22.0 g/t respectively for I year hybrids whereas, the values were 29.0 mm, 4.5 and 23.0 g/t for II year hybrids, slightly better than the first one. Further, the hybrids grown at Ludhiana and Sriganaganagar were found to possess better Micronaire value (4.2) compared to those from other centres for both the categories. The hybrids with code Nos. 6005, 6001, 6002, 6016, 6017, 6007, 6009, 6019, 6020, 6022 under I year category and code Nos. 6053, 6054, 6052, 6055 under II year category were satisfying fibre quality norms and were noted to be promising.

#### 4. *Miscellaneous Trials :*

The cotton research stations all over India conduct some trials which are not in regular AICCIP technical programme. Such trials are considered as miscellaneous trials and a brief summary of these trials conducted at different stations are given below.

*Abohar :* Four different trials were conducted and in all 35 samples were tested for fibre quality. *G. hirsutum* trials were for longer staple (30.0 mm) having high value of Micronaire (4.7), whereas, *G. arboreum* trial gave very poor quality. The fibres pertaining to varieties Varun 9, Varun 10, LH.2107 possessed good fibre quality.

*Faridkot:* Only one trial of RCGM was conducted for Bt and non Bt cottons. There was no difference in fibre quality between Bt. and Non Bt. cotton. The fibres from these

varieties were of long staple (27.0 mm), coarser (4.7) and possessed strength around 22.0 g/t.

*Hisar:* The RCGM trial for Bt and Non Bt cottons gave similar results as those of Faridkot centre. In another agronomy trial four cottons were tested for full spinning. The varieties LH.1918, CSHH.243, and RCH.134 Bt. gave good CSP values at 40s count.

*Ludhiana:* Under hybrid trial, the hybrid BS. 6488 gave good fibre quality. Other samples although had good length and fineness but showed slightly lower values of strength for that length. The hybrid MRC.7017 gave better fibre quality compared to the check sample in Bt II trial. Under Bt.III trial, the hybrids NCS.951, MRC.7031, NCS.950 were slightly better in quality compared to the check.

*Sirsa:* Twenty-six samples under Bt. demonstration trial were tested for fibre parameters. The varieties CSHG.1862, CSHG.960, CSHG.1633, CSH.21, CSH.7106, CSH.3118, MRC.6025, JKCH.1947, RCH.134, under this trial gave acceptable fibre quality.

*Sriganaganagar:* The RCGM trial samples were of shorter staple (26.0 mm) but were finer with Micronaire value of 3.7 and better strength of 23.0 g/t. All the samples showed good combination of fibre parameters and were better than the check samples. In another trial, six standard cottons were tested for fibre quality. They constituted shorter staple (23.0 mm) coarser (4.7) and had lower strength (18.0 g/t) value.

## CENTRAL ZONE

1. *G.hirsutum* Trials:

*Preliminary Varietal Trial (PVT) Br.03* : These trials were conducted both in rainfed as well as irrigated areas. Under rainfed trials, the samples were received from seven locations whereas, from irrigated areas they were received from four locations. Under irrigated trial Br.03(a), the fibre properties were found to depend on the varying location. Strain from Junagadh and Talod were coarser (5.0) with higher strength values whereas, those from Khandwa and Rahuri were finer (4.0) but lower in strength. Strains from Talod gave very high strength value of 27.0 g/t. The strains CCH.1831, LH.2076, H.1282 and P.72-9-37 were better in quality and found to be promising. On an average, fibres from rainfed trial Br.03 (b) displayed 2.5% span length 27.0 mm, Micronaire 3.9 and strength 21.0 g/t. The length and strength values were nearly same at all locations. The strains from Banswara and Indore had finer (3.2) fibres as compared to those from other centres. The strains CCH.226, GTHV.01/124, KH.155, GTHV.0/35 were satisfying fibre quality norms.

*Co-ordinated Varietal Trial (CVT) Br.04*: These trials were conducted in rainfed as well as under irrigated conditions. The irrigated trial Br.04(a) was conducted at four locations and the rainfed trial Br.04(b) at nine locations. In general, the strains of Br.04(a) trial produced fibres belonging to long staple 27.0 mm, possessing lower strength of 20.0 g/t and varying in Micronaire value from 4.2 to 5.2. Comparatively fibres from Talod centre gave higher value for strength (24.0 g/t), while

Khandwa and Rahuri centres gave finer value of Micronaire (4.2). Only two strain CNH.012 and CCH.510-4 were found promising. The strain CCH.510-4 had been proposed for release. The fibre properties of Br.04(b) trial had location-wise variation. The 2.5% span length varied from 24.0 mm (Banswara) to 29.0 mm (Bhavanipatna) while, the Micronaire value from 3.2 (Banswara) to 4.7 at Akola and Bhavanipatna. However, the strength remained lower (20.5 g/t) at all locations. The strains Gshv 01/26, NH.615, GBHV.148 and PH.1009 were found promising in quality.

*Intra-hirsutum Hybrid Trial Br.05*: The samples under Br.05(a) irrigated trial were received from five locations whereas, those pertaining to rainfed experiments Br.05(b) trial were received from six locations. These samples were tested for fibre properties and some were tested for spinning potential also.

In general, the samples of Br.05(a) trial possessed nearly uniform length value of 30.0 mm at all locations, but Micronaire and strength values did show variation with reference to locations. The Micronaire was around 3.9 on an average although Talod centre recorded a higher value of 4.7. Similarly, strength was around 22.0 g/t, but Jalgaon and Talod centre showed higher values of 26.0 g/t. The strains GGCH.70, Chhatrapati, PCHH.78, GK.150, ARCHH.9770, GTHH.138, PCHH.33, KDCHH.402, NRCH.786, Daftari 1663, Tulsi 27, CSHG.2459, PMCH.99 were found to have satisfactory fibre quality norms.

The fibres originating from the strains of Br.05(b) trial possessed nearly same values

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of fibre parameters at all locations. The values of 2.5% span length, Micronaire and bundle tenacity were 29.0 mm, 3.9 and 21.0 g/t respectively. Most of the strains were spun to 40s count. The strains, Tulasi 9, Ajeet 177, PMCH. 99, GGCH.50, VBCH.2231, MLCH. 318, VBCH. 2402, Nandi 666, ZCH.5007, Tulasi 18, CINHH.121 fared well at 40s count. The fibres from strains VBCH.402 and Ajeet 177 obtained from Yavatmal centre performed well even at 60s count.

### 2. *Inter-Specific Hybrid Trial Br.15 :*

Samples under this trial were tested from three centres *viz.* Anand, Banswara and Aurangabad. The values of 2.5% span length (34.0 mm) and bundle tenacity (26.0 g/t) for the fibre samples received from this trial were nearly the same at all three locations. However, the Micronaire value was around 3.5 at Anand and Aurangabad but was very low at around 2.9 at Banswara. The samples from Aurangabad centre were spun to 60s count and except KDCHB.407 all gave very good CSP values at 60s count.

### 3. *G. arboreum Trial :*

*Co-ordinated Varietal Trial (CVT) Br.24:* This trial was conducted at eight locations and their samples were tested for fibre quality. Most of the fibre samples were found to be short stapled (25.0 mm), very coarse with Micronaire above 5.0 possessing very low strength around 20.0 g/t. Only fibres from the strain AKA.9703 from Khandwa satisfied the fibre quality norms. However, the strains DLSa 1001, GAM.115, GAM.67, AKA.9763, HLSa.802, KWA.225, GAM.141, CINA.343 produced appropriate combination values

of 2.5% span length and bundle strength, though Micronaire values were on the higher side (indicating coarseness).

*Desi Hybrid Trials Br.25:* This trial was conducted at seven locations. Most of the samples from all locations were of shorter staple (25.0 mm), very coarse (5.5) possessing lower strength values around 20.0 g/t. The hybrid Mahabeej DH.903, GGCH.81 from Jalgaon and MRDC.227 from Khandwa gave satisfactory fibre properties and noted to be promising.

### 4. *G. herbaceum Trials :*

*Coordinated Varietal Trials Br.34 :* The trial Br.34-1 was conducted at two locations *viz.* Bharuch and Surat, whereas trial Br.34-2 at Viramgam. On an average, the 2.5% span length, Micronaire and bundle tenacity values for fibres realised from the trials were 24.0 mm, 5.4 and 17.0 g/t respectively. The fibres from the strains DDhc.1001 and GShv.93/2001 were found to be slightly better in quality as compared to others. However, none of the strains had satisfactory fibre quality norms either from Br.34-1 or Br.34-2 trial.

### 5. *ICAR Bt Cotton Trials :*

Bt. cotton trials conducted in Central Zone were of three types *viz.* (1) I yr trial, (2) Intra-hirsutum and (3) Interspecific hybrid trials. The I yr trial was conducted at three locations whereas, Intra-hirsutum trial at ten locations and interspecific hybrid trial at two locations.

In general, the 2.5% span length,



Micronaire and bundle strength values for the fibre samples generated in these trials were around 28.0 mm, 4.3 and 21.0 g/t respectively for I yr category samples. The strength value was noted to be higher (24.0 g/t) for samples from Khandwa centre. The samples with Code Nos. 6161, 6152, 6157, 6160, 6151, 6156 had appropriate combination of fibre attributes. The samples under intra-hirsutum category gave nearly same value of 2.5% span length (29.0 mm) at all locations. However, the Micronaire values showed large variation from 3.1 (Indore) to 5.2 (Junagadh) with reference to location. Bundle tenacity also varied from 19.1 (Nanded) to 23.6 (g/t) (Indore and Talod). The samples with Code Nos. 6114, 6111, 6126, 6101, 6102, 6104, 6108, 6112, 6113, 6125, 6103, 6123, 6115 had fibre quality that was in agreement with norms. Under Inter-specific hybrid trial, the 2.5% span length, Micronaire and bundle strength values were 33.0 mm, 2.9 and 27.0 g/t respectively on an average. All the three fibre parameters showed higher values for samples at Banswara compared to those from the Indore centre. The samples with Code Nos. 6142 and 6145 from Banswara were found to be promising.

#### 6. *Miscellaneous Trials :*

*Akola:* Eleven miscellaneous trials were conducted in Akola. In all 170 samples from these trials were tested for fibre properties. Most of the samples of *G.hirsutum* trials belonged to long staple (27.0 mm) class; slightly coarser (4.6) possessing lower strength of 20.0 g/t. Fibres from *G. arboreum* trials were found to possess still lower values for fibre properties. Some of the strains like

AKH. 0205, CAH. 142, CAH.. 231, AKDH. 9, AKA.9620, JLA.601 were noted to have acceptable fibre properties.

*Bhawanipatna:* In all, four hybrid trials were conducted and the samples tested for fibre properties. Most of the samples had good length (30.0 mm) and fineness (4.3) but possessed slightly lower bundle strength (23.0 g/t). The hybrid Gold 90, had shown good combination of fibre properties (2.5% span length, 38.4mm, Micronaire 3.8 and strength 28.8 g/t). Other hybrids like no. 169, 179, TCHH.117, Jaya, gave higher strength values above 25.0 g/t.

*Jalgaon:* A variety NRCH.996 was tested for its spinning potential alongwith fibre properties. It gave very good CSP values (2380) at 50s count. The variety also gave low trash % (1.3), good uniformity of yarns and lower neps/km values.

*Khandwa:* Two trials were conducted and their fibre properties were evaluated. The hirsutum trial yielded fibres possessing good combination of fibre properties and samples with Sr. No. 1 & 3 were found promising. In arboreum trial, sample at Sr. No.3 was found to possess good fibre quality.

*Nagpur:* A pre-release variety CINA.316 was tested for fibre properties and spinning potential. However, due to very low strength value, it failed to give desired CSP even at 20s count.

*Nanded:* Seven different trials were conducted and in all 105 samples tested for fibre properties. On an average most of the samples gave good combination of 2.5% span

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length (27.0 mm) and Micronaire (4.0) but exhibited lower strength values around 20.0 g/t. The varieties H8NBt, DBTH.5, MRC.6198 Bt, NH.615, NH.641, NH.634 found promising with good fibre quality. The pre-release variety NH.615 fared well at 40s count.

*Rahuri*: Twenty-two different trials were conducted and nearly 400 samples of these trials were tested for fibre properties. A pre-release variety RHC.0688 performed well at 40s count. It was processed in the mill for 20s count and gave satisfactory performance. In other trials, RCH.2Bt, JKCHB.212, RAHB.37 gave satisfactory combination of fibre properties (2.5% span length 29.0 mm, Micronaire 3.6, strength 24.0 g/t). Samples generated under the Micronutrient treatment, bio-vita, agronomic requirement trials had 2.5% span length 27.0 mm, Micronaire 3.7 and strength 22.7 g/t. In remaining trials, the strains F1P1 F1P2, F2P4, ARPH.13, JLA. 601, JLA.1298, JLA.2300, AKA.9703, AKA.9602, RHC.0560, RHC.0561, RHC.0565, RHC.0570, RHC.0571, RHC.0578, RHC.062, RHC.063, RHC.071, RHCb.003, RHCb.004, RHCb.010, RHCb.011, RHCMS.6, RHCMS.8, RHCMS.10, JLA.1402, JLA.1600 Fuzzy, JLA.1600 NAKED, RHRAH.1 gave good combination of fibre attributes.

*Viramgam*: In all seventeen different trials of *G. herbaceum* were conducted and their samples were evaluated for fibre properties. Most of the samples gave very low strength of around 19.0 g/t and high Micronaire value above 5.0. However, a few strains such as GVhv 553, GVhu.490, GVhv.503, GVhv.533, GSHH.2605, GSHV.99/291, GSHV.01/1338

displayed marginally superior fibre quality compared to others.

### SOUTH ZONE

#### 1. *G. hirsutum* Trials :

*Preliminary Varietal Trial (PVT) Br.03*: Under irrigated condition trial Br.O3(a), the samples were received and tested from four locations while under rainfed trial Br.O3(b), the samples were received and tested from three locations. On an average the strains under Br.O3(a) were of long staple (28.0 mm), finer (4.2) and possessed strength around 22.0 g/t. The strains from Siruguppa centre were superior in quality compared to other centres giving higher value of 2.5% span length (31.5 mm) and strength (23.7 g/t). The strain CCH.1831 was found promising at three locations. Other strains like L 761, P 72-9-37, NDL.762, CN.012 were also found to be noteworthy. The strains of Br.O3(b) trial on a comparative term were found to have lower quality and only one strain HAG.811 was noted to be promising. The fibre quality for strains of Adilabad centre was better compared to those of Dharwad and Aruppukottai.

*Coordinated Varietal Trial Br.04*: The trial Br.04(a) was conducted at four locations and the samples were tested for fibre properties. The strains from Siruguppa centre produced superior quality fibres compared to other centres and three strains viz. GSHV.97/612, HAG.1055, ARB.760 were found to be promising. The strains CPD.787 from Adilabad was also found to be worth mentioning. However no strains from Coimbatore and Srivilliputtur centres could

be identified with good fibre quality.

*Intra-hirsutum Hybrid Trials Br.05:* The trials Br.05(a) were conducted at five locations while trials Br.05(b) were conducted at six locations. The samples of these trials were tested for fibre properties and a few of them were tested for spinning potential as well. On an average, the values of 2.5% span length (30.0 mm) and strength (22.0 g/t) were nearly the same for fibres generated from all locations but Micronaire value was found to vary from 3.3 at Raichur to 4.1 at Siruguppa and Hyderabad. The samples from Ranebennur were spun to 30s count and GK 150, NCHH.55, ARCHH.9770 gave good CSP values at 30s count. The hybrids Tulasi 117, SB.5, Indam 178 from other centres gave good combination of fibre properties and were noted to be promising.

The strains of Br.05(b) trials also gave almost uniform value of 2.5% span length (28.0 mm) and strength (21.0 g/t) from all locations. However, the Micronaire value was noted to be varying from 3.7 at Ranebennur and Salem to 4.5 at Aruppukotai. The samples from Dharwad and Ranebennur were spun to 30s count and the hybrids PHCH.72, ARCHH.9654, SSB.25, RAHH.14, BSSCH.29, JKCH.55, CINHH.121 and Tulasi 9 gave good CSP values at 30s count.

## 2. *G.arboreum Trial :*

*Co-ordinated Varietal Trial (Br.24):* This trial was conducted only at two locations viz. Dharwad and Mudhol. The strain from Dharwad was spun to 20s count and AH.65, AH.11, KWA.23, KWA.225, ARBHA.35,

CINA.333, AKA.0109 performed well at 20s count giving higher CSP values. Some of the strains like AH.65, AH.11, KWA.225, ARBHA.35 produced fibres with good fibre quality at Mudhol too.

*Desi Hybrid Trial (Br. 25):* This trial was conducted at four locations and their samples were tested for fibre properties. In general, the 2.5% span length, Micronaire and bundle tenacity values were 25.0 mm, 6.0 and 19.0 g/t respectively. The samples from Dharwad were processed for spinning and two hybrids viz. GGCH.81 and JKCDH.501 performed well at 20s count. None of the hybrid from Hyderabad or Ranebennur centres was found promising. The hybrid JKCDH.501 gave promising fibre quality in one of the replications at Mudhol.

## 3. *Interspecific Hybrid Trial (Br.15) :*

This trial was conducted at three locations viz. Coimbatore, Davengere and Dharwad. The samples from Dharwad were spun to 60s count whereas others were tested only for fibre quality. The hybrids USHB.25, CCHB.727, JKCHB.214 were found to be most promising giving around 2900 CSP value. The hybrids HAGHB.1042, RAHB.47, DHB.915, PSCHB.901, RAHB.170, MRC.680 were also noted to be performing well at 60s count. The hybrids DH.915, PSCHB.901, USHB.25, HAGHB.1042, CCHB.727, RAHB.47, JKCHB.214, RAHB.170, MRC.680 from Coimbatore and Davengere centres also produced fibres with good strength value above 25.0 g/t.

## 4. *ICAR Bt. Cotton Hybrid Trials:*

Two categories of Bt. cotton hybrid trials

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*viz.* Bt. I and Bt. II were conducted in South Zone and their samples were tested for fibre properties. Samples of Bt. I trial were received from four locations. These samples gave nearly uniform values of 2.5% span length (30.5mm) and Micronaire (4.2) at all locations. However, the strength value was found to vary from 21.0 g/t at Adilabad and Aruppukotai to 23.7 g/t at Siruguppa and Srivilliputtur. The hybrids with code nos. 6206, 6211, 6217, 6222, 6224, 6214, 6210 and 6212 were found to satisfy the fibre quality norms. The hybrids under Bt. II category were received only from one location, Siruguppa, and it gave superior fibre quality compared to those of Bt. I. The 2.5% span length, Micronaire and strength values were 31.0 mm, 4.0, and 25.0 g/t respectively. The hybrids with code nos. 6252, 6254, 6256, 6258 were noted to be worth promising.

### 5. *Miscellaneous Trials :*

*Adilabad:* Samples were tested from four different trials conducted at Adilabad. From hybrid trial, the hybrid ADB.117, ADB.136 and from varietal trial, the varieties ADB.103, ADB.104, ADB.113 were found to have satisfactory fibre quality norms. Under agronomy trial the strength values were lower (22.4 g/t) with respect to 2.5% span length (30.9 mm) and none was found promising. In university Bt. trial, the code nos. A1, A2, A4, A5 gave strength above 25.0 g/t. However, all the three fibre parameters were not matching and only one variety A4 was worthy for further evaluation.

*Coimbatore:* Three trials were conducted at Coimbatore. In a long staple trial twenty one samples were tested for its spinning potential

at 60s count. The samples at Sr. No. 7,12,13,14,15,16,17,18, 19 performed very well at 60s count giving CSP values above 2400. In another medium staple trial, samples were spun to 40s count. The samples with code nos. 22, 23,24,26, gave good CSP values (2300) for 40s count. The samples pertaining to a station trial were of longer staple (32.0 mm) and finer (3.2) possessing lower strength value of 23.0 g/t.

*Dharwad:* A colour cotton genotype was tested for its fibre quality and spinnability. However, it had 2.5% span length only 20.6mm, Micronaire 2.7 and strength 16.6 g/t. This sample did not perform well even at 6s count.

*Hyderabad :* A pre-release hybrid JKCHB.212 was tested for fibre properties and spinning potential. This hybrid performed very well at 80s count giving 2680 CSP value. The fibres also had lower trash % (1.6) and acceptable yarn uniformity in terms of U% values.

*Srivilliputtur:* A pre-release variety TSH.9704 was tested for fibre properties and full spinning. It gave good CSP value at 40s count with U% value of 17.8.

### **National Trials**

Table 6 gives the ranges of fibre properties for different National Trials. In all ten trials were conducted. The abstract of each trial is provided below:

#### **1. *Initial Evaluation Trial Br.02(a):***

This trial containing forty strains was conducted at seventeen locations. All the

TABLE 6 : SUMMARY OF NATIONAL TRIAL

Trial	No. of Entries	No. of Locations	Range of Fibre Properties		
			2.5% S.L. (mm)	Micronaire	Bundle Tenacity (3.2 mm g/t)
Br.02(a)	37	17	21.3 – 34.6	2.4 – 5.9	16.8 – 26.9
Br.02(b)	29	12	20.1 – 34.2	2.7 – 5.4	16.4 – 26.5
Br.05(a1)	38	16	23.1 – 35.2	2.6 – 5.9	17.2 – 33.4
Br.05(a2)	13	10	24.3 – 33.4	2.8 – 5.6	19.0 – 26.2
Br.05(b1)	24	10	24.7 – 34.3	2.9 – 5.1	16.6 – 26.5
Br.05(b2)	11	5	24.3 – 32.8	2.5 – 5.2	17.4 – 24.7
Br.15	12	12	23.1 – 38.1	2.0 – 4.2	18.7 – 32.8
Br.22(9/b)	30	16	16.1 – 29.1	4.0 – 7.0	12.1 – 24.0
Br.25	13	13	15.9 – 27.9	3.7 – 7.0	13.3 – 23.2
Br.34	12	2	21.8 – 26.8	4.1 – 6.2	14.8 – 23.0

samples realized from the trial were tested for fibre properties. The 2.5% span length on an average was 26.0 mm and was nearly the same for samples from all locations. However, the Micronaire value was found to vary from 3.1 at Banswara and Raichur to 5.2 at Junagadh and bundle strength ranged from 19.5 g/t at Coimbatore, Hisar, Banswara to 23.0 g/t at Adilabad and Siruguppa. In all 56 samples were found to be promising satisfying the fibre quality norms. Amongst them, the strains CA.100, RS.2455, GSHV.152, CSH.3114, LH.2111, CNHO.23, CCH.226 were noted to be performing well at more than four locations.

### 2. Initial Evaluation Trial Br.02(b):

This trial involving twenty-nine strains was conducted at twelve locations. On an average the fibres generated in the trial had 2.5% span length about 27.5 mm at all

locations except at Indore and Banswara where it recorded lower value (25.4mm). Similarly, the Micronaire value was lower around 3.2 at Banswara and Indore, otherwise it was 4.2 at all other locations. The strength value in general was noted to be lower (20.0 g/t) except at Aruppukotai centre where it recorded still lower values (18.0 g/t). In all, forty-one samples were found to satisfy the fibre quality norms. Amongst them the strains NH.627, GJHV.360, BS.33, H.1259, CPD.817, CNH.040 were found to be performing satisfactorily at more than three locations.

### 3. Intra-hirsutum Hybrid Trial Br.05(a)-1:

This trial consisting of thirty-seven hybrids was performed at sixteen locations. Location-wise variation was noted in all the fibre parameters. The 2.5% span length varied from 26.0 mm (Banswara) to 31.0 mm

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(Hyderabad) while Micronaire value varied from 3.1 (Raichur and Banswara) to 5.0 (Bhavanipatna and Talod) and bundle strength from 20.0 g/t (Coimbatore, Rahuri, Banswara) to 26.0 g/t (Talod and Siruguppa). Forty-seven samples were seen to be satisfying the fibre quality norms. Amongst them the hybrids HHH.438, Prateek 5, SVHH.139, RajHH.710, HSHH.16, GTHH.119 were found to be promising at more than three locations.

#### **4. *Intra-hirsutum Hybrid Trial Br.05(a)-2:***

This trial on thirteen hybrids were conducted at ten locations. In general, the values of 2.5% span length (27.0 mm) and bundle strength (21.0 g/t) were found to be nearly the same at all locations. However, at Srivilliputtur and Siruguppa centres their values were slightly on the higher side (29.0 mm and 23.0 g/t). At the same time Micronaire value was noted to vary from 3.1 at Raichur to 5.1 at Junagadh. The hybrid HHH.433 from Coimbatore, GSGHH.155, LMSH.236 from Faridkot and HHH.437, RAJHH.26, CSHG.1862, LMSH.236, AHH.31 from Siruguppa were found to satisfy the fibre quality norms.

#### **5. *Intra-hirsutum Hybrid Trial Br.05(b)-1:***

Under this head trials were conducted at ten locations for twenty-four strains. In general, location-wise variation was noted in all the three fibre parameters while, the 2.5% span length varied from 27.6 mm (Khandwa) to 31.3mm (Hyderabad), Micronaire and strength varied from 3.4 (Indore) to 4.7 (Bhavanipatna) and 20.0 g/t (Dharwad, Khandwa) to 24.1 g/t (Hyderabad) respectively. The hybrids Tulsi 45,

VBCH.2510, AACH.1283 gave good strength values above 25.0 g/t. The hybrids ARCHH.7180, Tulsi 45, PSCHH.675, AACH.1283 were found to be worth as they satisfy the fibre quality norms for samples from Akola, Aruppukotai, Indore and Hyderabad respectively.

#### **6. *Intra-hirsutum Hybrid Trial Br.05(b)-2:***

This trial incorporating eleven strains was conducted at five locations. On an average, the values of 2.5% span length, Micronaire and strength were around 28.0 mm, 4.0 and 21.0 g/t respectively. However, the 2.5% span length for fibres from Amreli and Nanded was lower (26.5mm) while Micronaire was on the higher side (4.5) for Bharuch samples. Only two hybrids ARCHH.6904 and DMSHH.50 from Akola were worth a mention.

#### **7. *Inter-specific Hybrid Trial Br.15:***

Under this trial, twelve strains were evaluated at twelve independent locations. On an average the values of 2.5% span length, Micronaire and strength were noted to be 34.0 mm, 3.2 and 24.5 g/t respectively. However, the 2.5% span length value for fibres generated from Indore was lower (28.0 mm) while the Micronaire value was lower (2.4) for samples from Raichur and strength was higher (27.0 g/t) for those from Maheboobnagar, Siruguppa, Srivilliputtur and Anand. The hybrids GSHB.876, AHB.901, RAHB.188, JKCHB.215 and GGCH.90 were found to be satisfying the fibre quality norms.

#### **8. *Initial Evaluation Trial Br.22(a/b):***

This trial was conducted at sixteen

locations with thirty entries. Most of the strains from all the locations were of short staple type (23.0 mm) with very high Micronaire (5.7) and very low strength of 18.0 g/t. Comparatively the strains from Sriganganagar centre were slightly better than samples from other centres. In all, 18 samples were satisfying fibre quality norms and worth promoting. Amongst these, the strains AH.38, PA.08, CINA.346, DLSa.102, were found promising at more than two locations.

#### **9. *Desi Hybrid Trial Br.25:***

This trial consisting of thirteen hybrids was conducted at thirteen locations. Most of the samples were of short staple type (22.0 mm), with very high Micronaire (6.2) and very low strength of around 17.0 g/t. The samples from Faridkot centre recorded slightly higher value for strength (19.7g/t) compared to other locations. The hybrids AKDH.5 from Ludhiana and Sriganganagar, GSGDH.184 and Swadeshi 651 from Sriganganagar and JKCDH.717 from Viramgam were worth promoting as they satisfied the fibre quality norms.

#### **10. *Coordinated Varietal Trial Br.34:***

This trial conducted only at two locations *viz.* Bharuch and Surat involved twelve entries. Most of the samples were very coarse (5.5) and of lower strength (18.0 g/t). Most of the strains were found to be not satisfying fibre quality norms except the strains like GShv.557, GShv.591, RAHS.4 which were noted to be a shade better than the lot.

#### **b) Tests on Standard and Trade Varieties of Indian Cottons**

##### ***Evaluation of Quality of Major Trade Varieties Grown in Different Parts of the Country***

During the period under report 73 trade varieties have been received from different locations from Haryana, Gujarat, Maharashtra, Karnataka and Tamil Nadu for 2007-08 season. Fibre, spinning and yarn tests are being carried out on all these samples.

##### ***Evaluation of the Quality of Standard Varieties of Indian Cottons***

During this period, 43 standard cotton varieties grown under ideal conditions were received from different Agricultural Universities and their regional units for 2006-07 season. The fibre, spinning and yarn tests were carried out on all the samples and the test reports were issued in the form of Technological circulars. Comparing the major fibre properties of these varieties with their respective values at the time of release it was observed that most of the varieties maintained 2.5% span length and Micronaire values, but tenacity values were found to be lower than the assigned values at the time of release for many varieties.

#### **c) Research Work done on Specific Agricultural and Technological Aspects Relevant to Improvement of Cotton Attributes**

##### ***Wear Comfort Studies of Knitted Fabrics***

During the reporting period flat knitted fabrics of various knit densities were prepared with the help received from the

## RESEARCH ACHIEVEMENTS

National Institute of Fashion Technology, Kharghar, Navi Mumbai. Organic cotton of 10s count and cotton polyester blended (80% polyester and 20% cotton) yarns of 12s count were used for the purpose of knitting. Fabrics with the same knit density but from different cottons were also prepared. Varieties of cottons used were DCH.32, Digvijay, G.Cot.21, G.Cot.10 and G.Cot.23. The yarns made by using these varieties were of the same count and with the same twist per inch (TPI). After knitting, all the fabrics underwent five cycles of wash and dry processes to achieve dimensional stability. Physical parameters of fabrics like GSM, Course/inch, Wales/inch, thickness (mm) were estimated. Wear comfort parameters of knitted fabrics like water vapour transportation time (minute) upto 82.5% RH, air permeability and thermal insulation values were also estimated.

From the analysis of data, it was observed that both the knit density and GSM influence the comfort parameters of various fabrics. This may be attributed to the available pore spaces between yarns and also on the nature of materials. In the case of knitted cotton fabrics, the wear comfort parameters were also influenced by fineness of the fibre and it may be ascribed to surface area covered by the fibres and also the packing density of yarns. The following information could be drawn from the study:

- Water vapour transportation time increased with knit density and also with thickness of cotton fabrics.
- Air permeability of fabrics decreased as knit density increased and also as the Micronaire was lowered.
- A inverse linear relation exists between water vapour transportation time and air permeability of cotton fabrics.
- A power band type of relation was observed to exist between water vapour transportation time and air permeability of cotton-polyester blended fabrics.
- Thermal insulation values did not exhibit any trend.

### ***Design and Development of Lap Preparation Machine for Microspinning of Cotton Samples***

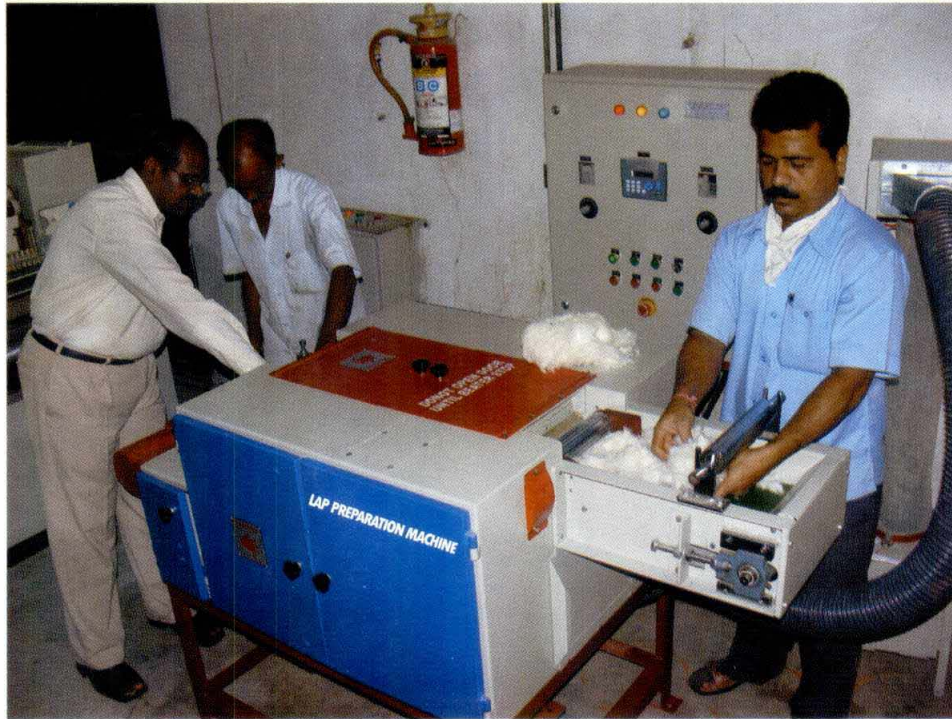
The newly developed machine is suitable for opening cotton samples weighing approx. 60-100 gms and then converting it into a mini lap in about 15 min. time. The machine has three motors, one each for feed, delivery and suction. The Inverter drive for speed control enables quick adjustments of speeds of the working elements.

Presently, opening and lap preparation by the machine is being compared with that of the existing manual method (by pinjari method).

### ***Demand Model for the Consumption of Cotton Fibre in Textile Sector***

A demand model was fitted for consumption of raw cotton in domestic market and also import and export demand for raw cotton was estimated. Domestic demand for raw cotton was found to be inversely related to domestic price and positively related to installed spinning capacity. Among the variables, the installed spindles i.e., spinning capacity was found to be significant determinant of the domestic consumption of raw cotton. Import demand





*Lap Preparation Machine for Microspinning Cotton Samples Designed at CIRCOT*

for raw cotton was noted to be a function of domestic as well as the international price. While the domestic price was positively related, the international price was negatively correlated with import demand.

Export demand for raw cotton was fitted as a function of both domestic and international price and the model had a very poor R square value indicating that both domestic and international price are non significant. On inclusion of Domestic production of cotton, the model showed significant improvement in R square value. Domestic price and production were found to be significant variables affecting the export demand for raw cotton.

Demand model was fitted for consumption of cotton yarn in domestic market as well as its export demand. Cotton yarn exports were noted to be a function of both domestic and international price as well as its production. While the domestic price was negatively related, international price was positively related to export demand although both these variables were not found to be significant. Export demand for cotton yarn was found to be a positive function of cotton yarn production and a significant factor in determining the extent of demand. Domestic demand for consumption of cotton yarn in power loom, handloom as well as in textile mills were found to be function of yarn price.

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### EXTERNALLY AIDED PROJECT

#### *Processing of Banana Pseudostem for Fibre Extraction and Its Utilisation for Preparation of Value Added Products (AP Cess Fund)*

Experiments conducted on spinning of banana on jute system revealed that it is possible to produce yarns to tex values matching those for jute. Doubling of banana yarn has improved its breaking load, breaking extension and tenacity by more than 50%. Addition of 20% jute in banana fibres also improved the breaking extension and tenacity of the blended yarn.

Paper produced from banana cut fibres obtained from scutcher waste was noted to have high quality with the quality improving further with the use of NaOH in pulp

preparation. It was observed that paper made from long length textile grade fibres of banana was of much better quality than that obtained by using cut fibres, matching with currency grade paper. Optimization trials are in progress.

Extraction of banana fibres was carried out at Dapoli in the plantation available with the agronomy department of BSKKV-Dapoli. About 25 kg of fibre sample and 50 kg of scutcher waste was collected for further work. A part of scutcher waste was taken to the hand made paper institute at Pune in wet condition for conversion into Hand made paper. About 15-20 kg of banana fibres were converted into yarns. These yarns have been converted into plain woven fabric of about 250-400 GSM. Tests on fabric sample are under way. It appears that this fabric may be useful as upholstery.



*Fabric made from Banana Fibres*

***Development of Improved Cultivation Package of Ramie (Boehmeria nivea L. Gaud) for Different Agro-climatic Conditions and Technological Improvement of the Fibre for Textile***

One hundred kg of decorticated ramie fibres received from CRIJAF, Barrackpore were subjected to biochemical degumming. The degummed and bleached fibres were sent to SITRA, Coimbatore for blending with cotton and also for yarn making and weaving.

The fibres were stapled, blended with Shankar 6 cotton and spun. Blending trials indicated that 30% ramie with 70% cotton resulted in better properties. Woven fabrics were prepared and converted into garments.

A Review Meeting was held at CIRCOT on 25.2.08 under the Chairmanship of Dr. H.S. Sen, Director, CRIJAF, Barrackpore which was attended by scientists from all the participating centres. The project has been given an extension upto 31st May, 2008.



*Garments made from Cotton-Ramie Blend*

***A Value Chain for Cotton Fibre Seed and Stalk: An Innovation For Higher Economic Returns to Farmers and Allied Stake Holders (NAIP : Component 2)***

The objective of the project is to identify the various links from cotton cultivation to fabric production, strengthening the existing weak links, increasing the seed cotton output with better lint quality attributes, yarn and fabrics. With the possible value addition at every stage in this chain including utilisation

of by products of cotton cultivation, the project is expected to bring additional remuneration to the farming community, raw material to the board industry, promote rural employment and indirectly save forest timber. This project has been funded by the World Bank through the National Agricultural Innovation Project (NAIP). Apart from CIRCOT which is the lead centre, CICR, Nagpur, and private player like Super Spinning Mills, Coimbatore are involved in this joint venture.

## RESEARCH ACHIEVEMENTS

During the reporting period the following activities were carried out.

- Meeting of the Consortium Implementation Committee (CIC) was held on 9<sup>th</sup> Jan. 2008. Eighteen persons, including members and invitees participated in the meeting. Dr. S. Sreenivasan, Director, CIRCOT was in the Chair. Dr. R.P. Nachane, Consortium Principal Investigator for the project, gave a brief introduction about the work envisaged in the project. A broad work plan for the first six months of the project was discussed and formulated.
- The first meeting of Consortium Advisory Committee (CAC) was held on 9<sup>th</sup> Jan. 2008 under the Chairmanship of Shri Suresh Kotak, President, Kotak & Company. Seven Members Dr. S. Sreenivasan, Director, CIRCOT, Mr. Arun Shankarrao Kulkarni, Mr. Omprakash Mor, Dr. Niyatee Bhattacharya, Mr. Sirish R. Shah, Dr. J.P. Mittal and Dr. R.P. Nachane and invitees Mr. Pradeep V. Gujarathi and Mr. Anand Mor were present for the meeting. Since this was the first meeting, all the members presented were briefed about the project by Director, CIRCOT and Dr. R. P. Nachane, Secretary, CAC & CPI of the project.
- About 10 hanks of cotton yarn were bio-scoured at CIRCOT under the following experimental conditions. Yarn bundles of 40s count were subjected to anaerobic bio-scouring treatment for 12 h.
  1. The treated samples were washed thoroughly. The washed samples

were boiled with 0.5% NaOH (owf). The samples were subsequently subjected to acid rinse with 0.25% acetic acid for 5 min. and washed with tap water.

2. The above bio-scoured samples were subjected to the following post-treatment:
  - boiling with 0.5% NaOH for 30 min.
  - boiling with 0.5% NaOH containing peroxide bleach for 30 min.
  - boiling with 0.5% NaOH containing soap solution for 30 min.
  - boiling with 0.5% NaOH containing soap solution and EDTA for 30 min.

The initial result showed that the dye pick up was uniform throughout the fabric.

- A launching workshop was held at CIRCOT, Mumbai on 9<sup>th</sup> Jan. 2008. The workshop was inaugurated by Shri P.D. Patodia, Chairman, Confederation of Indian Textile Industries (CITI), Mumbai. The occasion was graced by Shri Suresh Kotak, President, Kotak and Company. The workshop was attended by around 70 persons from industries, trade, research organizations and other stake holders. Dr. J.P. Mittal, National Coordinator, NAIP, informed the gathering about NAIP in general and Dr. R.P. Nachane, Consortium Principal Investigator for the project, gave a brief

introduction about the work envisaged in the project.

- Two different types of yarn 20s and 2/40s, 50kg each, compact, gas singed in hank form have been procured from SSM mill, one of the partners of the Consortium. These have been transported to the Natural Dyes Resources (NDR), at Sawantwadi, Maharashtra for carrying out initial trials for bio-scouring as per CIRCOT technology.
- Cotton Stalk Chipping (Nagpur): About 30 tons of cotton stalks have been chipped at Jaipur village in Wardha District in Maharashtra and have been transported to GTC Nagpur for preparation of particle boards.
- One awareness workshop, mainly for the cotton farmers of the Coimbatore region was organized on 5<sup>th</sup> March 2008. About 70 farmers participated.
- Second awareness workshop for farmers of the Nagpur region was organized on 18<sup>th</sup> March 2008. About 75 farmers participated. In these awareness workshops, demonstration on clean picking, on-farm storage and transportation of seed cotton and collection, cleaning, chipping and transportation of cotton stalks to board industry was organized by CIRCOT experts.
- CPI attended one training programme on **Training Need Analysis for Innovation in Agriculture** during 27-29 Feb. 2008 at IIM, Lucknow.

#### **Design and Development of Rubber Dams for Watersheds (Under NAIP Component 4 : C10130)**

This NAIP funded project is under taken to design and develop rubber composites suitable for making rubber dams, design and develop components of rubber dams and to evaluate the prototype rubber dam. In this project, Indian Rubber Manufacturers' Research Association (IRMRA), Thane is the Consortium Leader and CIRCOT, Water Technology Centre for Eastern Region (WTCER), Bhubaneswar and M/s. Kusumgar Corporates (KC), Mumbai are the Consortium Partners. CIRCOT's role in this project is as follows:

- Translation of rubber dam composite specifications in terms of technical fabric and yarn requirements (in consultation with Kusumgar Corporates).
- Working out the fabric design safety factor.
- Procurement and preparation of appropriate yarn samples.
- Optimisation and production of cotton covered core spun yarns, since it has been found that cotton provides better anchorage with rubber component (in an earlier research).
- Deciding the experimental design for the fabric quality optimization to be executed out by Kusumgar Corporates.
- Characterization of all yarn and fabric samples.
- Statistical analysis of experimental design and other data.

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- Design optimization through RSM (Response Surface Method) technique.
- Deciding the optimum technical fabric to be used for the proto dam making.
- Refinement of yarn and fabric specifications as per the test data on the rubber composite and trial data on rubber dam.
- To build an empirical model relating to fabric specifications and rubber composite characteristics, to be used for production of rubber dam and similar type of products.
- Documentation of technology for dam fabric production jointly with Kusumgar Corporates.

During the reporting period the following activities were carried out :

- i. Launch workshop held at IRMRA, Thane on 1<sup>st</sup> March 2008.
- ii. Recruitment of RA and SRF completed.
- iii. Visit of one research staff in a core-spinning unit, Pune was organised.
- iv. Visit of CIRCOT researchers to rural communes Narangi village, Dist. Raigad (Maharashtra)
- v. Visit of CoP-PI's to Jhanjavati river dam site at Vijayawada, Andhra Pradesh.
- vi. Some of the raw materials like nylon, polyester fibre, metallic wires and other consumable procured.
- vii. Literature survey of World Textile Abstracts and other journals for previous work done on rubber dams, yarn and fabric requirements for such

applications is being carried out.

### ***Quality Evaluation of Cotton Fibres (TMC Project 4.1)***

In all 970 samples for 2007-08 season were tested and reported. Of these 400 samples belonged to MM. 1.1, 116 samples under MM. 1.3, 328 samples under MM. 1.4, 92 samples under MM.2.1 and 34 samples were under MM.2.2 projects. Out of 970, 100 samples were found promising and 31 samples have shown high strength value than normally found for that length group. Data on 1267 samples of 2006-07 season was presented in the Annual Workshop in June 2007.

### **CORE AREA III : FINISHING AND DYEING OF COTTON WITH NATURAL AND ENVIRONMENT FRIENDLY AGENTS**

#### ***Application of Nanoparticles in Paper Coating***

The second trial of paper coating was carried out at PAPRI, Orissa by using the conditions standardised earlier. The coating colours were applied on the base paper reel and coating was carried out in blade mode on both side of the web. Coated webs were cut into A4 size sheets and calendered in the laboratory calendar using soft nip mode at 50 °C and 35 bar pressure. Base paper as well as coated & calendered paper were conditioned at 27±1 °C temperature and 65±2 % relative humidity prior to testing as per standard methods. It was noted that brightness, whiteness and print density of nano-zinc oxide coated paper were higher as compared to bulk zinc oxide coated paper. When nano / bulk zinc oxide were mixed with china clay (in equal proportion) same

trend was observed. The glossiness, smoothness and print uniformity of coated paper were found to be significantly better only when nano-zinc oxide was mixed with china clay (in equal proportion) followed by bulk zinc oxide-china clay mixture with pure nano-zinc oxide and bulk zinc oxide coated paper to follow.

The antifungal and antibacterial properties of coated paper were also carried out as per the standard methods. Result showed that full fungal as well as bacterial growth was seen on and around the base paper, while bulk zinc oxide coated paper exhibited slightly less fungal and bacterial growth as compare to base paper. Nano-zinc oxide coated paper showed no fungal and bacterial growth on and around the paper.

Tensile index of fungal infected paper was measured as well and result showed around 50% and 35% loss in tensile index with respect to base and bulk zinc coated paper samples respectively, whereas only 10% loss was encountered in case of nano-coated paper. Therefore nano zinc oxide is an excellent antibacterial and antifungal agent when used for paper coating.

When coated paper samples were exposed to UV light the colour of the paper turned yellow due to degradation. Zinc oxide coated paper samples were kept under UV light for 48 h and their colour parameters were measured and it was found that nano-zinc oxide coated paper samples are more UV resistant than bulk coated paper. The cost of the nano zinc oxide prepared under the

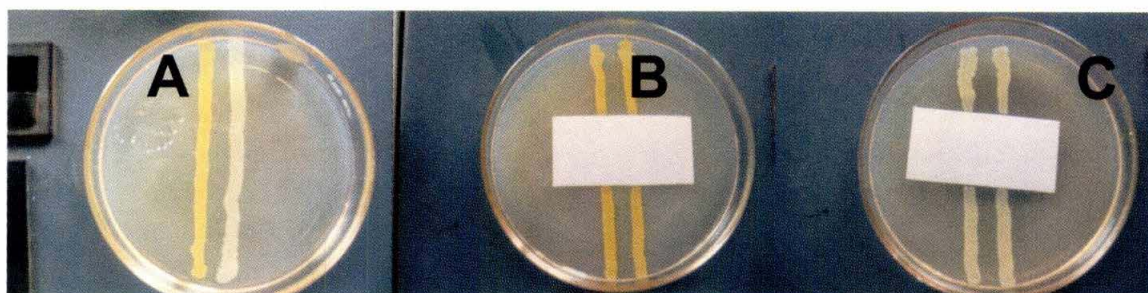


Image A represents the control growth of *Staphylococcus aureus* (yellow line) and *Klebsiella pneumoniae* (white line). Image B corresponds to nano-ZnO coated paper that restricts the growth of *S. aureus* and image C corresponds to nano-ZnO coated paper that restricts the growth of *K. pneumoniae*.

project was noted to be considerably cheaper (1/10) than commercially available nano-zinc oxide. Therefore nano-zinc oxide is a suitable and economically effective coating material and could be used for paper samples meant for documents which are to be preserved for years together.

#### **Application of zinc oxide nanoparticles for imparting different functional finishes to cotton textiles**

Zinc oxide – soluble starch nanocomposites (nano-ZnO) were synthesized using a novel wet chemical process. The nano-ZnO impregnated cotton

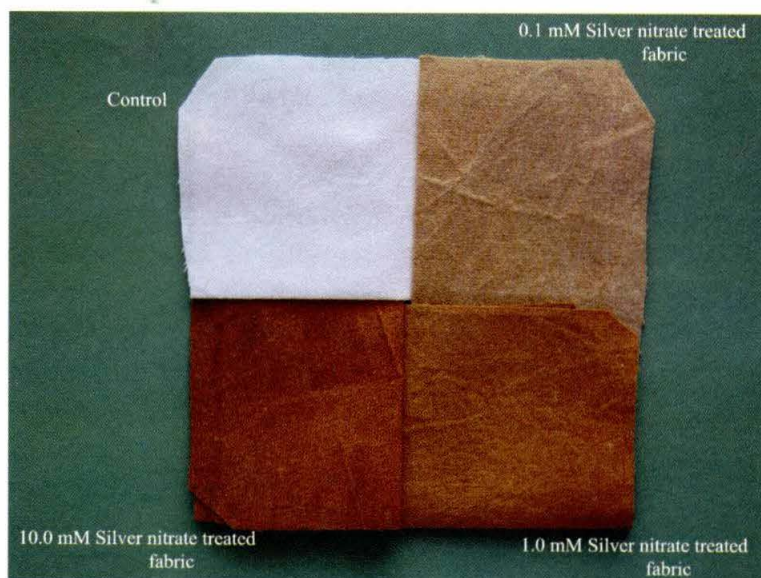
## RESEARCH ACHIEVEMENTS

fabrics showed excellent antibacterial activity against two representative bacteria, *Staphylococcus aureus* (Gram positive) and *Klebsiella pneumoniae* (Gram negative). The quantitative antibacterial study showed that >99% activity was retained till 15 hand washes after which there was a significant reduction in its activity. The effect of storage conditions and containers on the antibacterial activity of nano-ZnO was carried out. Nano-ZnO powder was stored in glass / polythene and stored in UV / high RH / high temperature (45°C) for 300 h and analyzed for antibacterial activity. In all cases, the antibacterial activity (>99%) was maintained even after exposure to harsh conditions in both containers. A scale up trial was carried out for the preparation of 500 g nano-ZnO in a single batch. Also, the effluent generated during preparation was analyzed for COD, BOD, pH and zinc content. Except zinc content, all other parameters were within the permissible limits. A simple protocol for the preparation of zinc oxide *in*

*situ* on the surface of cotton fabric is now being explored. This may help to improve its efficiency and wash fastness.

### ***Application of Silver Nanoparticles for Antimicrobial Finishing of Cotton Textiles***

Nano-silver was produced by two novel methods (microbial & biochemical) and characterized. These nanoparticles showed excellent antibacterial activity against two representative bacteria *Staphylococcus aureus* and *Klebsiella pneumoniae*. Conditions for coating nanoparticles onto cotton fabrics were standardized with and without a stabilizer under various conditions. Low concentration of nano-silver (1.0 mM in dye bath) resulted in uniform coloured (yellowish) coating on cotton fabrics in the presence of stabiliser, but antibacterial activity was not found to be significant. This may be due to the presence of organic stabilizer (starch/protein). High concentration of nano-silver (> 1.0 mM) resulted in patchy appearance of yellow



*Silver nanoparticle coated cotton fabric*

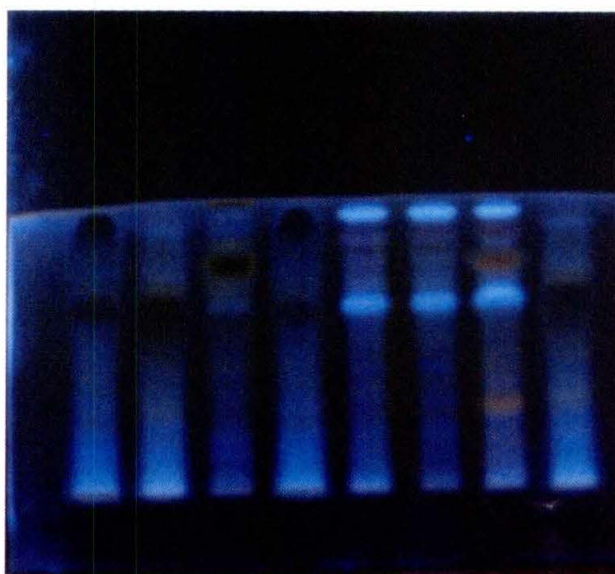


colour on the fabrics. Hence, there is a need to explore alternative protocols for the preparation of nano-silver with different stabilizers. Also, suitable applications have to be explored for the use of starch/protein stabilized nano-silver.

### ***Spectroscopic and Chromatographic Characterization of Natural Dyes***

HPTLC patterns of the extracts from

marigold flowers (three types), chrysanthemum flowers (two types) and aster flowers were developed in a solvent system which also facilitated recording of uv-vis spectra of the separated constituents. It could be inferred from the position of spots on the chromatogram and their uv-vis spectra that basic HPTLC pattern of all marigold flowers was similar and it was different from the basic HPTLC pattern of chrysanthemum



*HPTLC Fingerprints under UV light*

and aster flowers. Basic HPTLC patterns of both types of chrysanthemum flowers were similar and had a resemblance with a part of HPTLC pattern of aster. Thus, it will be inferred that the basic HPTLC pattern can serve as a marker for identification of these flowers.

### ***Production of Xylanase by *Aspergillus niger* by Solid State Fermentation and its Application to Lingnocellulosic Materials***

Earlier, studies were carried out on the

effect of physico – chemical factors on xylanase production and optimisation of conditions for xylanase activity. Attempts have been made to evaluate the effect of various sugars, sodium salts and nitrogen sources on the production of xylanase by *Aspergillus niger* by solid state fermentation process. Among the sodium salts, sodium chloride was found to increase the xylanase production by 16.8% while sugars did not support the enhancement of xylanase production. Among the nitrogen sources,

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sodium nitrate produced 30% more xylanase. The xylanase activity of the enzyme produced on sodium nitrate was 36.9 mg/g of wheat bran.

Preliminary work on application of xylanase to reduce the use of bleaching liquor by pretreatment of xylanase to bagasse pulp and hydrolysis of cottonseed hulls to produce sugars was found to be yielding positive results.

### **Scale-up Trials on Crosslinking of Cotton Blended Fabrics with Polycarboxylic acid Mixtures**

Different trials on crosslinking were conducted by changing the M:L ratio from 1:20 to 1:3 and pH of mixture from 2.6 to 3.5. The trials proved that the fabric could be uniformly treated even at lower M : L with no adverse effect on properties.

Analysis of the handle properties of cross linked fabrics indicated that the stiffness improved as reflected by the higher value for koshi. Hence, crosslinked fabrics are less limpy. Crosslinking also improved fullness and softness of the fabrics as shown by the Fukurami Values.

Trials were conducted to see the effect of multiple washings on cross linked fabric. The fabrics were subjected to different mode of multiple washings. A set of samples was obtained by subjecting to machine-wash to a cycle of 5 washes and 10 washes following AATCC test method 124-2005. Another set of samples was obtained by washing by hand for 5 times and 10 times, each time using 2 g/l soap solution and drip drying.

It was observed that multiple washings did not affect the physical properties of the cross linked fabrics. The strength retention and crease recovery angle decreased slightly after repeated washings of 10 washes by hand whereas in case of machine wash, there was negligible decrease. Machine washing reduced smoothness appearance of the cross linked fabrics than hand washing. The repeated washings improved whiteness index. As far as the handle properties are concerned, multiple washings in any form decreased smoothness, stiffness and softness of the fabrics. Crosslinking resulted in the decreased values of 2 HB/B and 2 HG/G, thus giving high dimensional stability to the fabric. Hence, crosslinked fabric would be lively in handle and would easily recover from the gentle crushing.

Improvement in air permeability of the cross linked fabrics due to chemical treatment was an uncommon phenomena. Hence, repeated tests were carried out, which have shown it to be significant. To find out the reason for this increase in air permeability of the crosslinked fabrics, the treated and untreated fabrics were evaluated for fabric parameters such as count, crimp, ends/picks, thickness and GSM. It was observed that the picks and crimp % of weft yarn of the treated fabrics were decreased. The image analysis of the treated and untreated fabric confirmed the increased optical porosity of cross linked fabrics. Percent open spaces for treated and untreated fabrics were found to be 14.06% and 12.15% respectively.

Further, comfort properties of the fabric such as thermal insulation value (TIV) and

water vapour permeability (WVP) were measured for untreated and treated cotton, polyester and P:C blended fabrics and repeatedly washed cross linked cotton fabrics. A decrease in thermal insulation value was observed for cross linked cotton fabrics. In other words, cross linked cotton fabrics will transfer heat more readily than untreated cotton fabrics. In case of polyester and P : C blend fabrics, no appreciable change in TIV was observed. Multiple washings of cross linked cotton fabrics increased the thermal insulation values of the fabrics.

Cross linking treatment decreased the water vapour permeability of the cotton fabrics whereas in case of polyester and P:C blended fabrics, the treatment did not have much effect on the water vapour permeability of the fabrics.

#### ***DP Finishing of Dyed Fabric***

RFD (ready for dyeing) cotton fabrics of size 35×35cm ( 15-16g) were dyed using hot brand reactive dyes: Procion Brill. Blue H-5G and Reactive dye Procion Brill. Red H-8B. Six samples each, were dyed to 0.5%, 1.5% and 3.0 % shade. The dyeing was carried out in beaker dyeing machine, using standard procedure. After dyeing, soaping was carried out using non-ionic detergent at 70°C for 15min. CIELab and K/S measurements were conducted on all the samples, using Computerized Colour Matching System (CCMS). From the six samples dyed for each shade, two each were treated for durable press finish keeping pH of bath as 3.5 and 4.5, whereas other two were kept as control.

Various properties such as colour

measurements, smoothness appearance (SA) measurement, colour fastness (CF) to washing (Test-3), CF to perspiration and CF to rubbing were estimated for the treated samples. Further CRA, breaking strength, % elongation and % add on were also determined.

In case of blue-dyed fabrics, CRA values were highest for 3% shade treated at pH 3.5, and for samples dyed with red dye 1.5% and 3 % shade CRA values were same. In case of both the dyes, samples tend to be yellow as compared to control untreated dyed samples. DP ratings were noted to be about 4 to 4-5 for red-dyed samples and about 4 for blue-dyed samples. Fastness to washing (test-3) improved marginally after the DP treatment for both the dyes. Fastness to perspiration (IS:971) also showed marginal improvement in both colour change as well as staining in case of both the dyes. Fastness to rubbing (IS:766) was not found to be affected by the treatment and was noted to be very good for both the dyes.

It was observed that the cotton fabric samples dyed at 1.5% shade and treated for durable press finish with 4% PCA mixture, M:L (1:3), pH of solution as 3.5 and cured at 180°C exhibited best physical properties as well as colour parameters.

#### ***Synthesis of Titanium Dioxide Nanoparticles and its Application Onto Cotton Fabrics for Antibacterial as well as Self Cleaning Properties***

Titania nanoparticles have been synthesized using two different precursors

## RESEARCH ACHIEVEMENTS

namely titanium isopropoxide and titanium tetra chloride. The addition of these precursors to deionized / distilled water resulted in the formation of titanium hydroxide due to hydrolysis and condensation. Reducing the pH (<3.0) of the solvent by using nitric acid or hydrochloric acid accelerated the rate of reaction. To restrict the particle's size to nanometer dimension, the stabilizing agents like soluble starch and butane tetra carboxylic acid were tried in the solution. The presence of soluble starch / butane tetra carboxylic acid restricts the size of titania particles formed during hydrolysis / condensation either by steric hindrance or by electrostatic action. The solution was centrifuged at 12000 x g for 10 min, and the settled material was washed 5 times using distilled water to remove the byproduct and excess soluble starch / butane tetra carboxylic acid. After complete washing, the material was calcined at 400 °C for 2 h for complete conversion of titanium hydroxide to titania and to get crystalline titania. The product was characterized by X-ray diffraction, UV-visible spectrophotometer and spectrofluorimeter. The nano-titania gave the broader X-ray peaks as compared to commercially available titania due to ultra fine size. This result was supported by the UV-visible absorption spectrum where it showed blue shift due to its increase in band gap energy at nano-dimension. Further characterization by TEM and TGA is under way.

### **CORE AREA IV : UTILISATION OF COTTON PLANT RESIDUES FOR PRODUCTION OF VALUE ADDED PRODUCTS**

#### ***Determination and Characterisation of Oil and Protein in Bt. Cottonseeds***

Forty Bt. cotton seed samples pertaining to F1 and F2 generation were evaluated for oil content. Test results indicated a slight reduction in oil content for F2 seeds as compared to F1. Protein content estimation on sixteen samples was also completed.

About 150 samples have been collected from NAU, Navsari, U.A.S., Dharwad and JK Seeds Co., Hyderabad for testing and analysis.

#### **EXTERNALLY FUNDED PROJECTS**

##### ***Utilisation of Cotton Plant By-produce for Value Added Products***

A cotton stalk supply chain has been established. Trials indicated that chipping of stalks in the field itself using mobile chipper and transportation of chips to the board industry would be a more feasible and economical pathway. An NGO has been identified to do this job keeping in mind the future prospects of using cotton stalk as raw material for the board industry.

Boards of 9 mm, 12 mm and 18 mm thicknesses are being prepared at the Demonstration Plant (4' x 3') at GTC, Nagpur. A part of them were sold to local dealers.

Many entrepreneurs have visited the plant and are eager to take up cotton stalk supply to Board Industries. Half yearly review meetings both at the Institute and also at SMD were completed. Mid-Term Review by the team appointed by CFC, Netherlands has been completed and the report

submitted. The following are the major recommendations :

- To Identify an agent in the rural area to act as a nodal person in the cotton stalk supply chain
- To carry out a market survey of particle board industry especially that of cotton stalk based raw material in India.

Some main suggestions that emerged from the review are :

- To quickly establish a viable supply-chain mechanism under Component I.
- To involve a private player to lift cotton stalks from the field to board production units, if possible.
- Material loss due to transportation to be compensated from other options available to generate returns from waste to be explored.
- Need to have a fresh look into baling and compaction efficiencies in order to beat the cost inefficiencies arising out of transportation and storage.
- Need to impress upon the government to lower excise duty on cotton stalks or at the most making it *on par* with bagasse in the interest of cotton farmers
- Need to update market information and to conduct consumer trials
- Conducting awareness meets, developing web-site, email, newsletter and literature sharing for building confidence in using cotton stalks as raw material in the minds of not only the existing players but also those within

the wood/wood substitute industry

- Clearly establish the competitive edge of cotton stalks as raw material for particle board production against other available agro waste and wood waste.

***Commercial Technology Development for Value Addition to Cotton Plant By-produce (MMI 4.2 of TMC)***

Modifications have been incorporated in the roller type cotton stalk compacting machine and performance evaluation was undertaken. The unit is working satisfactory. Conditions have been standardized to prepare absorbent cotton from Bangal Desi cotton. Samples subjected to 48 hours anaerobic treatment at room temperature followed by hot water treatment resulted in the formation of absorbent cotton. Bleaching was also resorted to with H<sub>2</sub>O<sub>2</sub> depending on the end use. The process has been found to be feasible and viable on a commercial scale. A five kg trial was successfully undertaken for the production of absorbent cotton.

**CORE AREA V : DEVELOPMENT OF ENTREPRENEURSHIP FOR UTILISATION OF CIRCOT TECHNOLOGIES**

Training, Commercial Testing, Transfer of technology and consultancy are dealt under this core area. These activities are discussed in detail elsewhere in the Annual report.

Training Activity, Commercial Testing and Transfer of Technology and Consultancy are discussed in Chapters 3, 4, 5 and 3 respectively.

## Technology Assessed and Transferred

The greatest satisfaction and boost for a researcher's morale and for a research organization is the translation of research results to the needy end-user. It has to percolate easily and also in time without any obstruction.

Scientists at CIRCOT spend their time and energy in developing newer technologies in the field of post harvest processing of cotton and eco-friendly finishing of textiles and are also striving hard to bring to the forefront and popularise them in many ways. There has been a continuous monitoring of the transferred technologies and processes and a regular upgrading of the already developed innovations so as to provide continued benefit to the users. The Institute maintains a constant liaison with private organizations and entrepreneurs so that their needs are met and at the same time the Institute also generates revenue. This chapter summarises the technologies developed and consultancies offered by the Institute during the reporting year. Attempts were made for popularisation and commercial adoption of viable technologies through Awareness Meets conducted periodically at various places.

### Consultancies Undertaken :

1. Analysis of PVC resin by SEM for M/s. Reliance Industries Ltd., Chembur, Mumbai
2. Characterisation of Microbial Culture by SEM for M/s. Nicolas Piramal India Ltd., Goregaon, Mumbai
3. R&D for developing various machines in Ginning for M/s. Bajaj Steel Industries Ltd., Nagpur
4. Spinnability, microprocessing, HVI evaluation of lint and oil content determination of seeds for Bt and non Bt cotton for M/s. Uniphos Seeds & Biogenetics
5. To evaluate the purification efficacy of the party's equipment for M/s. ION Exchange India Ltd., Belapur Road, Rabale
6. Fibre Denier Determination from filter Raw samples for M/s. Godfray Philips India Ltd., Andheri, Mumbai
7. Internal audit under ISO-17025 for Cotton Association of India, Mumbai
8. Preparation and supply of chloroform extractives of the polymer supplied by the organization for M/s. PARC, Reliance Industries Ltd., Chembur, Mumbai
9. Analysis of Bt. Cottonseeds for Oil for M/s. Zuari seeds Ltd. Bangalore

- |   |   |
|---|---|
| 10. XRD Analysis of Non-Asbestos Fibre sample for M/s. Everest Industries Ltd. Nasik      | 3. Miniature Spraying System for Cotton Seeds (210684) on 8.10.07                 |
| 11. XRD Analysis of Pharma-drug Powder samples for M/s. Sanofi Synthelabo India Ltd., Goa | 4. Machine for Compacting Cotton Stalk Using Hydraulic System (210718) on 8.10.07 |

**Patents Granted**

1. Double Roller Gin with Improved Power Transmission Mechanism for Roller and Beater (210924) on 15.1.07
2. Hand-cum-Power Operated Cotton Stalks Compacting Machine (210671) on 8.10.07

**Commercial Testing :**

Nearly 6000 samples (Table 7) were tested during the year under report at the Headquarters Mumbai, GTC, Nagpur and the Regional stations at Coimbatore, Guntur, Sirsa, Surat and Dharwad. The Total revenue generated through commercial testing was around Rs. 20 lakh.

TABLE 7 : NUMBER OF SAMPLES TESTED AND REVENUE GENERATED

Name	No. of samples	Amount (Rs.) in Lakhs
HQ, Mumbai	2871	13.57
GTC, Nagpur	649	1.69
QE Unit, Coimbatore	875	1.86
QE Unit, Sirsa	525	0.97
QE Unit, Dharwad	306	0.42
QE Unit, Surat	302	0.55
QE Unit, Guntur	450	1.56
Total	5978	20.62

## 4

# Education and Training

### Education

The University of Mumbai has accorded permanent recognition to CIRCOT for guiding students for the award of Post graduate degree in Physics, Physical Chemistry, Organic Chemistry, Bio Physics, Microbiology and Ph.D. in Physics and Textile Manufacture, Biophysics and Microbiology under Section 88 of the Maharashtra Universities Act 1994 and amended by the Maharashtra Universities (amendment and continuance) Act 2000. The Institute has two guides for M.Sc. and four for Ph.D.

During the current year, two students were awarded M.Sc. in Microbiology while three were awarded Ph.D. degree in Physics. Further, the Institute has been recognised as a guiding centre for M.Sc. and Ph.D. courses in Home Science (Textiles) of the SNDT Womens' University, Mumbai. At present, one student is availing this facility to pursue her work for the award of Ph.D degree.

### Training

CIRCOT conducts regular training programmes on cotton quality evaluation for personnel drawn from cotton trade and industry. The Ginning Training Centre at Nagpur conducts training courses for fitters

and other workers in ginning industry on appropriate technologies in ginning for the production of clean quality cotton and on the maintenance aspects of ginning and allied machines.

The Institute organises special training courses in the operation of High Volume Instrument (HVI) and Advanced Fibre Information System (AFIS) and interpretation of test results obtained from these state-of-the-art facilities at the Headquarters. All training courses comprise informative lectures and a series of practical demonstrations along with visits to the Textile/ Ginning and Pressing industries to get practical knowledge on the respective subject. Course material in the form of a book containing details of test methods, statistical interpretations of results, etc. is provided to the trainees. The Institute also conducts special training programmes to personnel sponsored from industry on specified topics depending on demand.

#### ***(a) Training on Quality Evaluation of Textile Fibres for Personnel from Trade and Textile Industry***

During the period under report, 58 sponsored personnel were trained in quality evaluation of fibres, training on the use of HVI and AFIS and interpretation of results. There were also four trainees from Egypt.



***(b) Training on Ginning and Baling for Fitters, Operators and Managers from Ginning Industry***

At the Ginning Training Centre at Nagpur, regular training programmes are conducted for the benefit of gin operators and management staff on various aspects of

ginning and material handling. During the reporting period, training was imparted to 240 persons in 13 batches. At every training programme emphasis was given on the need to produce contaminant free clean cotton for use by the industry.

## Linkages and Collaboration

CIRCOT does not have an agricultural farm attached to it. However, the Regional Quality Evaluation units of CIRCOT located within the agricultural university premises serve as extension units for the Institute. Scientists of CIRCOT constantly interact with the scientists of agricultural universities and provide inputs on the technological aspects of cotton at different stages of crop development, post-harvest technology operations, etc. and thereby help in improving the quality of strains as per the requirement of the industry. The regional units of CIRCOT are used as windows to promote the technologies developed by CIRCOT for efficient utilisation of cotton crop by-products and other agro-waste materials. Since past few years, the Institute has been providing technological support to breeders from private seed industry for development of Bt. cottons by providing data on the spinnability, fibre quality, oil content, through contract/consultancy research. CIRCOT recently has established linkage with an NGO organisation *Varshad Vikas Sava Pratistan*, Akola to carry out field trials of the Low Cost Sliver Machine developed by the Institute. It has also established collaboration with the Indian Rubber Manufacturers' Research Association (IRMRA), Water Technology Centre for Eastern Region, (WTCER) (ICAR) and a

reputed private manufacturer of technical textiles viz. M/s. Kusumgar Corporate under the National Agricultural Innovation Project (NAIP).

Technology extension and out-reach activities are carried out through participation of the Institute in various exhibitions, *Kisan melas*, etc. conducted in different parts of the country. Besides, the Institute also undertakes collaborative research programmes with private sector, other research bodies connected with both state and central governments in post harvest technology and value addition to cotton and other natural fibres.

The Director and Scientists of CIRCOT serve as resource personnel in various committees constituted by the Bureau of Indian Standards for cotton and textiles and they participate in various seminars, symposia, conferences, etc. organised in the country that constitute a platform for the exchange of their knowledge and expertise in different fields of research. The Director and many scientists are members of advisory panels of institutions like ATIRA, BTRA, SITRA, CCI, ICMF, CAI, etc. Many of the Scientists also act as experts in several committees like Technology Development Board (TDB), Department of Science and Technology (DST) for assessment of

proposals for setting up / expanding cotton processing industry.

Many scientists are invited to give lectures and to participate in discussions related to cotton in particular and natural fibres in general organised by other institutions. They also publish their research findings both in scientific and popular journals, apart from participating in exhibitions displaying technologies and processes developed or improved by the Institute.

Publications of research findings in national and international journals constitute an important mode of extension activity. Publications in popular journals help to bring research closer to the user community.

The Institute conducts regular training courses on Cotton Quality Evaluation including elementary statistics applicable to textile testing for the sponsored personnel from the cotton trade and industry while at the GTC, theoretical and practical training is imparted on different aspects of ginning and maintenance of ginning machines. A hostel with facilities to accommodate about 20 trainees is presently available at GTC, Nagpur.

Another important form of extension activity is supply of information in response to various queries received on cotton fibre, yarn and fabric, consultancy services, contract research and bringing out regular pamphlets on various processes developed and innovations brought about by the Institute for use by different stake holders.

**Technical Queries:** Queries from private organisations, semi government, state and central government departments were received and replies sent promptly. Information on various technologies and devices developed by CIRCOT, instruments designed, methods of tests standardised for cotton fibre, yarn and fabric, quality levels of different cotton varieties, by-products and agro-waste utilisation, etc. were supplied to interested end users on numerous occasions.

**Commercial Testing:** The Test House at CIRCOT had received fairly large number of samples of fibre, yarn, fabric and miscellaneous items for tests on payment basis from industries, textile and other educational institutes, and state government bodies.

The details of number of commercial samples tested at CIRCOT, Mumbai during the period 2007-08 together with samples tested in the recent past are presented in Table 8.

TABLE 8 : DETAILS ON SAMPLES TESTED AT CIRCOT X PLAN AND XI PLAN

Sr. No.	Type of Tests	Total during X Plan (2002-03 to 2006-07)	XI Plan (2007-08)
1.	Ginning, Fibre, Trash Content and Spinning	8438	1961
2.	Yarn	254	160
3.	Fabric	445	418
4.	Miscellaneous	516	332
	<b>Total</b>	9653	2871

## LINKAGES AND COLLABORATION

Besides routine tests, some special tests were also carried out on samples received from various organisations against

payment of fees. Highlights of these tests are given below in a tabular form.

Sr. No.	Party's Name	Test
1	M/s. Anaband Ltd., Chennai	Anti bacterial activity
2	M/s. Arch Pharma Lab, Mumbai	XRD
3	B.M.C., T Ward, Mulund, Mumbai	Paper tests
4	B.T.R.A., Mumbai	Eco testing
5	M/s. Calyx Chemicals & Pharma Ltd., Mumbai	XRD
6	M/s. Croda Chemicals, Navi Mumbai	Contact angle
7	M/s. Eco Lab. Mumbai	UV absorbance
8	M/s. Ion Exchange , Navi Mumbai	TOC
9	M/s. Ipsa Texchem Ltd. , Mumbai	Anti bacterial activity
10	M/s. J.B. Chemicals & Pharmaceutical Ltd., Mumbai	XRD
11	M/s. Krishna Corp., Mumbai	Thickness of plastic bag
12	M/s. Lavino-Kapur Cottons Pvt. Ltd., Mumbai	Eco testing
13	M/s. Mohanraj sampatraj, Mumbai	Thickness of plastic bag
14	M/s. Nair Hospital, Mumbai	Thickness of plastic bag
15	M/s. Perfect Gasket & Engg., Mumbai	SEM
16	M/s. Prabhudas & Co., Mumbai	Thickness of plastic bag
17	M/s. Quality Product, Mumbai	Thickness of plastic bag
18	M/s. Ratnagiri Chemicals Ltd., Mumbai	FTIR
19	M/s. Ridhi Siddhi Corp., Mumbai	Anti fungal activity
20	M/s. Shanti Plastics, Mumbai	Thickness of plastic bag
21	M/s. Shraddha Analytical Services, Mumbai	XRD
22	UICT, Mumbai	SEM
23	VJTI, Mumbai	SEM
24	VJTI, Mumbai	Anti bacterial activity
25	M/s. Vinit Enterprises, Mumbai	Thickness of plastic bag

**Exhibition / Publicity**

During the year, CIRCOT participated in various exhibitions displaying the technologies developed and those available for commercialisation. Large number of entrepreneurs and farmers evinced keen interest in the technologies. The opportunity provided was utilized to initiate and finalise a few consultancy projects.

**Exhibition:**

- AgroVision at Kasturchand, Nagpur from August 15 -18, 2007.

- “Krishi 2007” at Nashik organised by Media Exhibitors from November 29 – December 3, 2007.
- “Western Region Krishi Mela 2008” jointly organised by Sardarkrushinagar, Dantiwada Agricultural University, Deesa, Gujarat and Deptt. of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India, New Delhi from March 15 – 18, 2008.

LINKAGES AND COLLABORATION



*Shri Datta Meghe, Hon'ble M.P. (Rajya Sabha), Maharashtra, paid a visit to CIRCOT Stall during 'Agrovision 2007 at National Expo, Conference, Symposium on October 15-18, 2007 at Nagpur*



*CIRCOT stall at "Western Region Krishi Mela 2008"*

## 6

### Publications

#### A. Annual Report

Annual Report of the Central Institute for Research on Cotton Technology for the year 2006-2007.

#### B. Research Publications (CIRCOT Publications – New Series)

717. Vigneshwaran, N., Kathe, A.A., Varadarajan, P.V., Nachane, R.P., Balasubramanya, R.H. – *Biomimetics of Silver Nanoparticles by White Rot Fungus, Phaenerochaete chrysosporium*, Colloids and Surfaces B : Biointerfaces, Vol. 53, pp. 55-59, 2006.
718. Arude, V.G., Shukla, S.K. and Paralikar, K.M. - *Evaluation of Worker Exposure to Airborne Dust in Cotton Ginneries*, Journal of Agricultural Engineering, Vol. 44, No. 3, pp. 30-32, 2007.
719. Blaise, D., Ravindran, C.D. and Singh, J.V. - *Effect of Nutrient Management Practices on Growth, Fruiting Pattern and Yield of Asiatic Cotton (G. arboreum L.)*, J. Plant Nutrition and Soil Science, Vol. 170, pp. 1-8, 2007.
720. Chandramouleeswaran, S., Mhaske, S.T., Kathe, A.A., Varadarajan, P.V., Prasad, V. and Vigneshwaran, N. - *Functional Behaviour of Polypropylene / ZnO-soluble Starch Nanocomposites*, Nanotechnology, Vol. 18, pp. Paper No. 385702, pp. 1-8, 2007.
721. Chitranayak and Yadav, A. – *Vastra Uddyog Mein Kapas Ka Mahatva*, Vastra-Paridhan, Vol. 62, pp. 28-29, 2006-2007.
722. Chitranayak, Yadav, A., Prasad, V. - *Bin Bune Vastron Ke Badhte Charan*, Vastra Paridhan, Vol. 63, pp. 22-27, 2006-07.
723. Chitranayak, Yadav, A., Prasad, V. and Sundramurthy, C. - *Kapas Avan Vastra Uddyog Ek Jhalak*, Raj Bhasha Rashmi, Vol. 2, pp. 17-19, 2007.
724. Gayal S.G. and D' Souza, C.P. - *Enzymatic Hydrolysis of Cottonseed Meal for Simultaneous Oil Extraction and Preparation of Protein Hydrolysate*, Journal of Indian Society for Cotton Improvement, Vol. 32, No. 1, pp. 65-69, 2007.
725. Jadhav, S.B. and Paralikar, K.M., - *Optimizing the Frequency of Oscillating Beater in Double Roller Gin*, Indian Journal of Fibre and Textile Research, Vol. 32, pp. 184-188, 2007.
726. Jyoti M. Nath, Shukla, S.K. and Patil, P.G. - *Imaging and Soft Computing in*

*Cotton for Online Trash Identification*,  
**Journal of Agricultural Engineering**  
**Vol. 44, 3, pp. 1-7, 2008.**

727. Prasad, J., Tarun Kapur, Sandhar, N.S., Majumdar, G., Patil, P.G., Shukla, S.K., Jaiswal, B.N. and Patil, A.B. - *Performance Evaluation of Spindle Type Picker*, Journal of Agricultural Engineering, Vol. 44, No. 1, pp. 38-42, 2007.
728. Vigneshwaran, N., Ashtaputre, N.M., Varadarajan, P.V., Nachane, R.P., Paralikar, K.M. and Balasubramanya, R.H.- *Biomimetics of Silver Nanoparticles using the Fungus Aspergillus flavus*, Materials Letters Vol. 61, pp. 1413-1418, 2007.
729. Vigneshwaran, N., Kathe, A.A., Varadarajan, P.V., Nachane R.P., and Balasubramanya, R.H. - *Silver-Protein (Core-Shell) Nanoparticle Production using Spent Mushroom Substrate*, Langmuir, Vol. 23, No. 13, pp. 7113 - 7117, 2007.
730. Yadav, A., Nachane, R.P. and Hussain, G.F.S. - *Air Permeability of different Layers of Woven Fabrics*, Journal of Polymer Materials, Vol. 24, No. 2, pp. 113-118, 2007.
731. Varadarajan, P.V., Balasubramanya, R.H., Nachane, R.P. and Mahangade, R.R. - *A New Bio-chemical Scouring Technique for Cotton Hand Processing Units*, Indian Journal of Fibre & Textile Research, Vol. 33, March, pp. 88 - 92, 2008.
732. Vigneshwaran, N., Bharimalla, A.K., Virendra Prasad, Kathe, A.A. and Balasubramanya, R.H. - *Functional Behaviour of Polyethylene-ZnO Nanocomposites*, Journal of Nanoscience and Nanotechnology, Vol.8, pp. 1-6, 2008.

#### C. Other Publications

1. Booklet on "*Scientific Processing of Cottonseed and Value Addition to its By-products*", Vigneshwaran, N., Balasubramanya, R.H. and Shaikh, A.J., 2007.
2. CIRCOT News – Vol. 9 (2), October 2006 to March 2007 and Vol.10 (1) April 2007 to September 2007.
3. CIRCOT Ginning Bulletin – Vol. 8 (1), April to September 2007.
4. Shweth Sarinika, Vol. 19, January to June 2007 and Vol. 20, July to December 2007.
5. CIRCOT ABSTRACTS, January-June 2007 and July-December 2007.

#### D. Paper Presented at Seminar / Conferences, etc.

1. Balasubramanya, R.H. and Shaikh, A.J. - *Value Addition to Cottonseed By-products* presented at the *National Seminar on Emerging Potential of Cottonseed & its By-products* held at CIRCOT, Mumbai on April 10, 2007.
2. Sreenivasan, S. - *Technologies for Sustainable Post Harvest Processing of*



- Cotton and Value Addition to Processing Waste: Exploring Synergies across the Supply Chains for Sustainable Industrial Networking* presented at the Expert Group Interactive Meet held at Nagpur on April 17, 2007.
3. Hussain, G.F.S., Nachane, R.P. and Shaikh, A.J. - *Database on Physico-Chemical and Structural Characteristics of Coconut Fibre* presented at the International Coconut Summit 2007 held at Kochi from May 7-11, 2007.
  4. Kathe, A.A., Prasad, V., Sundarmoorthy, C., Yadav, A.S., Vigneshwaran, N. - *Application of Zinc Oxide Nano Particles for Antibacterial Finishing of Cotton Fabrics* presented at the International Conference on Advances in Textiles, Machinery, Non-Woven & Technical Textiles ATNT – 2007 held at Coimbatore from June 18 - 20, 2007.
  5. Nachane, R.P. – *Measurement of Inverse Creep in Nylon Multifilament Yarn* presented at the International Conference on Advances in Textiles, Machinery, Non-Woven & Technical Textiles ATNT – 2007 held at Coimbatore from June 18 - 20, 2007.
  6. Parthasarathi, K., Borkar, S.P., Kathe, A.A., Prasad, V. and Vigneshwaran, N. - *Functional Behaviour of Cotton Textiles Coated with Nano-TiO<sub>2</sub>* presented at the Advances in Textiles, Machinery, Non-woven & Technical Textiles ATNT – 2007 held at Coimbatore from June 18-20, 2007.
  7. Patil, P. G. and Nachane, R.P., *Measurement of Inverse Creep in Nylon Multifilament Yarn*, Advances in Textiles, Machinery, Non-Woven & Technical Textiles ATNT - 2007, Coimbatore from June 18-20, 2007.
  8. Sreenivasan, S. - *Competitiveness and Prospects of Indian Cotton for Diversified Applications* presented at the Advances in Textiles, Machinery, Non-woven & Technical Textiles ATNT – 2007 held at Coimbatore from June 18-20, 2007.
  9. Sundarmoorthy, C., Bharimalla A.K., Chattopadhyay, S.K. - *Competitiveness and Stability of India's Cotton Yarn Trade in the Changing Global Textile Trade Regime* presented at the Advances in Textiles, Machinery, Non-woven & Technical Textile ATNT – 2007 held at Coimbatore from June 18-20, 2007.
  10. Patil, P.G. - *Cotton Plant Stalk – An Alternate Raw material to Board Industry* presented at the World Cotton Research Conference held at USA from September 10 - 14, 2007.
  11. Ahmed, M. and Chattopadhyay, S.K. – *Kapas-Ramie Mishrit Anokha Vastra (Hindi)* presented at the 10<sup>th</sup> National Seminar of Bharatiya Krishi Anusandhan Samiti held at Lucknow on October 28, 2007.

## PUBLICATIONS

12. Arude, V.G., Shukla, S.K., Manojkumar T.S. and Paralikar, K.M. - *Evaluation of Worker Exposure to Noise and Dust Pollution in Cotton Ginneries*, pp. 36, Abstracts of International Ergonomic Conference - HWWE 2007 held at CIAE, Bhopal from December 10-12, 2007.
13. Jyoti M. Nath, Shukla, S.K., Patil, P.G. and Paralikar, K.M. - *Computer Controlled System for Operating Machines in Modern Indian Ginneries*, pp. 55, Abstracts of International Ergonomic Conference - HWWE 2007 held at CIAE, Bhopal from December 10-12, 2007.
14. Sreenivasan, S. - *Prospects and Challenges for Cotton as a Natural Fibre for Diversified Textile Applications* presented at the 9<sup>th</sup> International and 63<sup>rd</sup> All India Textile Conference held at Ahmedabad from January 5 - 6, 2008.
15. Sujata, S. - *Preliminary Investigation on the Pesticide Protective Performance of Some Indian Cotton Fabrics* presented in the IUPAC sponsored First International Conference on Agrochemicals Protecting Crop, Health and Natural Environment organized by IARI Society of Pesticide Science and ICAR at New Delhi from January 8 - 11, 2008.
16. Nachane, R.P. - *Processing of Banana Pseudostem Fibre on Jute Spinning System* presented at the International Symposium on Jute and Allied Fibres Production, Application and Marketing held at Kolkata from January 10 - 12, 2008.
17. Sreenivasan, S. - *Past and Present Cotton Quality Scenario in India* presented at the National Level Training of Trainers (NLTT) on Refresher Course of TOF Master Trainees, DAC, Government of India, MANAGE at Hyderabad on January 10, 2008.
18. Sreenivasan, S. - *Cotton Textile Scenario in India* presented at the National Level Training of Trainers (NLTT) on Refresher Course of TOF Master Trainees, DAC, Government of India, MANAGE at Hyderabad on January 10, 2008.
19. Balasubramanya, R.H. - *Utilisation of Cotton Plant By-produce for Value Added Products* presented at the 49th Joint Technological Conference (ATIRA, SITRA, NITRA, BTRA) organised by BTRA at Mumbai from February 1 - 2, 2008.
20. Arude, V.G., Shukla, S.K. - *Performance Evaluation of Different Types of Seed Cotton Distribution Systems used in Modern Ginneries* presented at the 42nd ISAE Convention and Symposium held at Bhopal from February 1 - 3, 2008.
21. Arude, V.G., Shukla, S.K., Manojkumar, T.S. and Makwana, D.N. - *Evaluation of Cotton Processing Loss in Modernized Indian Roller Ginneries* presented at the

- 42<sup>nd</sup> ISAE Convention held at CIAE, Bhopal from February 1 - 3, 2008.
22. Balasubramanya, R.H. and Jyoti M. Nath - *Utilization of Low Free Gossypol Containing Cottonseed Meal in Broiler Feeding* presented at the 42<sup>nd</sup> ISAE Convention held at CIAE, Bhopal from February 1 to 3, 2008.
23. Chitranayak - *Analysis of Electrical Properties of Textile Materials and Nano- Finished Fabrics* presented at the
24. All-India Seminar on Futuristic Textiles organized by the Institution of Engineers (India) at Kanpur from February 9 -10, 2008.
24. Shukla, S.K., Arude, V.G., Jyoti M. Nath and Patil, P.G. - *Performance Evaluation of Cotton Loading-Unloading Machine for Heaping*, pp. 78, Abstracts in National Conference on Farm Mechanization held at Bhuvanewar from February 22-23, 2008.

## List of On-Going Projects During 2007-2008

### CORE AREA I : IMPROVEMENT IN GINNING OF COTTON

Sl. No.	Name of the Project	Principal Investigator	Associates
1.	Design and Development of Prototype Variable Speed Saw Gin	Dr. S.B. Jadhav	Shri Sujeet Kumar Shukla Dr. P.G. Patil Dr. T.S. Manojkumar
2.	Development of Techno-economically Viable Cottonseed Delinting Process to Recover Linters	Dr. P. G. Patil	Dr. K.M. Paralikar Dr. A.J. Shaikh
3.	Influence of Storing Conditions on Bale Quality	Dr. S.B. Jadhav	Dr. P.G. Patil Shri S.K. Shukla Dr. S.G. Gayal
4.	The Performance Evaluation of Cyclones used in Modern Ginneries	Shri S. K. Shukla	Shri V.G. Arude Dr. T.S. Manojkumar Smt. Jyoti Mintu Nath
5.	Design and Development of Barcode Technology for Tagging Cotton Bales	Smt. Jyoti Mintu Nath	Shri V.G. Arude Shri S. K. Shukla

### CORE AREA II : IMPROVEMENT AND QUALITY EVALUATION OF FIBRES, YARN AND FABRIC

Sl. No.	Name of the Project	Principal Investigator	Associates
1.	Evaluation of the Quality of Cotton Samples under the All India Co-ordinated Cotton Improvement Project	Director	Scientists and Technical Personnel
2.	Evaluation of Quality of Major Trade Varieties Grown in Different Parts of the Country	Director	Scientists and Technical Personnel
3.	Evaluation of Quality of Standard Varieties of Indian Cotton	Director	Scientists and Technical Personnel
4.	Wear Comfort Studies on Knitted Fabrics	Shri Achchhelal Yadav	Shri Muntazir Ahmed Dr. R.P. Nachane

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Sl. No.	Name of the Project	Principal Investigator	Associates
5.	Design and Development of Lap Preparation Machine for Microspinning of Cotton Samples	Er. A.K. Bharimalla	Dr. S.K. Chattopadhyay Dr. K.M. Paralikar Shri D.L. Upadhye
6.	Demand Model for the Consumption of Cotton Fiber in Textile Sector	Shri C. Sundaramoorthy	Dr. S.K. Chattopadhyay Dr. C.D. Ravindran Dr. K.M. Paralikar
7.	Fabrication and Evaluation of an Instrument for Measuring Electrical Properties of Textile Materials	Shri Chitranayak	Dr. R.P. Nachane Dr. D.N. Makwana Shri Achchhelal Yadav Shri Virendra Prasad

**CORE AREA III : FINISHING AND DYEING OF COTTON WITH NATURAL AND ENVIRONMENT FRIENDLY AGENTS**

Sl. No.	Name of the Project	Principal Investigator	Associates
1.	Application of Nanoparticles in Paper Coating	Shri Virendra Prasad	Dr. N. Vigneshwaran Dr. A.J. Shaikh
2.	Application of Zinc Oxide Nanoparticles for Imparting different Functional Finishes to Cotton Textiles	Dr. N. Vigneshwaran	Shri Virendra Prasad Shri Achchhelal Yadhav Shri C. Sundaramoorthy
3.	Application of Silver Nanoparticles for Antimicrobial Finishing of Cotton Textiles	Dr. N. Vigneshwaran	Dr. R.H. Balasubramanya Dr. R.P. Nachane Dr. P.V. Varadarajan
4.	Spectroscopic and Chromatographic Characterization of Natural Dyes	Dr.(Smt.) Sujatha Saxena	Dr. P.V. Varadarajan
5.	Production of Xylanase by <i>Aspergillus niger</i> sp. through solid State Fermentation and its Application to Lignocellulosic Materials	Dr. S.G. Gayal	Dr. R.H. Balasubramanya Kum. C.P. D'Souza
6.	Scale-up Trials on Crosslinking of Cotton Blended Fabrics with Polycarboxylic acid Mixtures	Shri R.M. Gurjar	Shri Virendra Prasad Dr. (Smt.) Sujata Kawalekar
7.	DP Finishing of Dyed Fabric	Shri R.M. Gurjar	Shri V. Prasad Shri R.R. Chhagani Dr. (Smt.) Sheela Raj Shri S. Sekar
8.	Production of Titanium Dioxide Nanoparticles and their Application in Cotton Textiles for Antibacterial and Self Cleansing Properties	Shri Virendra Prasad	Dr. N. Vigneshwaran Dr. A.J. Shaikh Dr. Sujata Kawlekar

LIST OF ON-GOING PROJECTS DURING 2007-2008

**CORE AREA IV : UTILISATION OF COTTON PLANT RESIDUES FOR PRODUCTION OF VALUE ADDED PRODUCTS**

Sl. No.	Name of the Project	Principal Investigator	Associates
1.	Determination and Characterisation of Oil and Protein in Bt. Cottonseeds	Dr. A.J. Shaikh	Dr. R.H. Balasubramanya Smt. Prema Nair Dr. (Smt.) Sudha Tiwari Smt. N.M. Ashtaputre

**EXTERNALLY FUNDED PROJECTS**

Sl. No.	Name of the Project	Funding Agency	Principal Investigator	Associates
1.	Processing of Banana Pseudostem for Fibre Extraction and its Utilisation for Preparation of Value Added Products	AP Cess Fund	Dr. R.P. Nachane	Dr. G.F.S. Hussain Dr. A.J. Shaikh Shri R.M. Gurjar Dr. N. Shanmugam
2.	Utilisation of Cotton Plant By-produce for Value added Products	CFC, Netherlands	Dr. R.H. Balasubramanya	Dr. A.J. Shaikh Dr. K.M. Paralikar Dr. P.V. Varadarajan Dr. R.M. Gurjar Shri P.G. Patil Shri S.K. Shukla Shri V.G. Arude
3.	A Value Chain for Cotton Fibres, Seed, Stalks: An Innovation for Higher Economic Returns to Farmers and Allied Stake Holders	National Agricultural Innovation Project (Component 2)	Dr. R.P. Nachane	Dr. K.M. Paralikar Dr. R.H. Balasubramanya Dr. P.V. Varadarajan Dr. A.J. Shaikh Dr. S.G. Gayal Shri R.M. Gurjar Dr. D.N. Makwana Shri D.V. Mhadgut Shri P.G. Patil Dr. S. Venkatakrishnan Shri Ram Parkash
4.	Design and Development of Rubber Dams for Watersheds	National Agricultural Innovation Project (Component 4)	Dr. S.K. Chattopadhyay	Dr. C.D. Ravindran Shri A.K. Bharimalla Shri A. Yadav

## SRC, RAC and Management Committee

### Institute Research Council Meetings

The One Hundred and Seventh Institute Research Council meeting of CIRCOT was held at the Committee Room on April 19 and 20, 2007 to discuss in detail about the progress made in each of the different projects under various Core Areas during the period from April 2006 to March 2007. The following new proposals were approved:

### Core Area I : Improvement in Ginning of Cotton

1. Development of Techno-economically Viable Cottonseed Delinting Process to Recover linters
2. Study of Bale Storage and Handling Practices under Changing Environment and its Effect on Lint Quality at Different Layers in Cotton Bale



*Discussion during the 107th IRC meeting of CIRCOT held on April 19 and 20, 2007*



3. The Performance Evaluation of Cyclones used in Modern Ginneries

**Core Area II : Evaluation and Improvement of Quality of Fibre, Yarn and Fabric**

1. Demand Model for the Consumption of Cotton Fibre in Textile Sector

A Half-Yearly Institute Research Council meeting was held on December 27 and 28, 2007 in which discussions were held on the progress of research projects carried out during April to September 2007. Dr. S. Sreenivasan, Director was in the Chair and all HODs and Scientists attended all the sessions. Technical Officers of respective divisions attended the sessions, relevant for each one of them.

The following new proposals were approved:

**Core Area I : Improvement in Ginning of Cotton**

- Design and Development of Barcode Technology for Tagging Cotton Bales

**Core Area II : Evaluation and Improvement of Quality of Fibre, Yarn and Fabric**

- Fabrication and Evaluation of an Instrument for Electrical Properties of Textile Materials

**Core Area III : Finishing and Dyeing of Cotton with Natural and Environment Friendly Agents**

- Production of Titanium Dioxide Nanoparticles and their Application in Cotton Textiles for Antibacterial and Self Cleansing Properties



*Discussion during the the half-yearly IRC meeting held on December 27 and 28, 2007*

### Management Committee Meeting

The Sixty-fifth meeting of the Institute Management Committee was held on August 10, 2007. Regular items like confirmation of minutes of the previous meeting, action taken on the recommendations of the

previous committee, progress of works, action taken on the recommendations of the IJC and Grievance Committee were discussed in the meeting. Progress made on the on-going research projects was presented by HODs of all the divisions.



*Discussion during the 65th IMC meeting of CIRCOT on 10th August 2007*

### Quinquennial Review for CIRCOT

The Quinquennial Review Team constituted by ICAR for the period 2002 – 2007 under the chairmanship of Prof. V. Subramaniam visited various divisions of CIRCOT on October 26, 2007 to review the progress made during the period under review. The Chairman accompanied by other Team members, Dr. S.S. Narayanan,

Dr. S.R. Male, Dr. T.K.S. Gowda and Dr. H.V.S. Murthy also visited various regional stations. After a series of discussions with various committees at the Headquarters, the QRT Team has submitted a draft report. After approval from the Institute Management Committee, the draft report will be submitted to the Council.



*QRT Members in the Mechanical Processing Division*

## Participation of Scientists/Technical Personnel in Conferences, Meetings, Workshops, Symposia, etc.

Director, Scientists and Technical Personnel of CIRCOT participated in the following scientific and technical conferences besides meetings connected with the work of this Institute.

Sr. No.	Meetings / Conferences / Seminars / Symposia, etc.	Place	Date	Participants
1.	One day National Seminar on Emerging Potential of Cotton Seed and its By-products	Mumbai	10-4-2007	All Scientific and Technical Personnel
2.	Annual Group Meeting of AICCIIP	Gujarat	11-4-2007 to 13-4-2007	Dr. S. Sreenivasan Dr. R.P. Nachane Dr. D. N. Makwana Dr. E. A. Pachpinde
3.	International Coconut Summit 2007	Kochi	7-5-2007 to 11-5-2007	Dr. A.J. Shaikh Dr. R.P. Nachane Dr. G.F.S. Hussain
4.	Tech – Mela	Mumbai	14-6-2007 to 16-6-2007	Shri D. Radhakrishnamurthy
5.	International Conference on Advances in Textiles, Machinery, Non-Woven & Technical Textiles ATNT - 2007	Coimbatore	18-6-2007 to 20-6-2007	Dr. S. Sreenivasan Dr. (Smt.) A.A. Kathe Dr. R.P. Nachane Shri C. Sundarmoorthy Shri Virendra Prasad
6.	NATP Stakeholders Workshop on A Value Chain for Cotton Fibre, Seed and Stalks : An Innovation for Higher Economic Returns to Farmers and Allied Stakeholders (Component 2)	Mumbai	19-7-2007 to 21-7-2007	All Scientific and Technical Personnel
7.	Conference on Automotive Textiles	Mumbai	30-8-2007	Dr. S.K. Chattopadhyay
8.	Workshop on Productivity of Cotton and Value Addition	Gujarat	5-9-2007	Dr. S. Sreenivasan Dr. K. M. Paralikar
9.	Workshop on Producing Zero Defect through Statistical Techniques	Chennai	8-10-2007 and 9-10-2007	Dr. D.N. Makwana Dr. C.D. Ravindran
10.	13th Hindi Seminar and Workshop	Goa	24-10-2007 to 26-10-2007	Shri R.D. Shambarkar

CONFERENCES, MEETINGS, WORKSHOPS AND SYMPOSIA,

Sr. No.	Meetings / Conferences / Seminars / Symposia, etc.	Place	Date	Participants
11.	Conference on the IBM Software Universe 07	Mumbai	30-10-2007	Shri D.Radha-krishnamurthy
12.	Seminar on South-south Cooperation for Cotton Sector Development and 9 <sup>th</sup> Round of Consultations on Cotton Development Assistance under the Director General's Consultative Frame Work Mechanism of Cotton: WTO	Switzerland	21-11-2007 to 23-11-2007	Dr. S. Sreenivasan
13.	TOC Analyser and Microbial Air Suppliers	Mumbai	27-11-2007	Shri R.R. Chhagani Shri R.S. Narkar
14.	15th National Conference of Agricultural Research Statisticians	Ranchi	3-12-2007 and 4-12-2007	Dr. C.D. Ravindran Shri D.V. Mhadgut
15.	Paperex 2007 Conference	New Delhi	7-12-2007 to 9-12-2007	Dr. A.J. Shaikh
16.	International Ergonomic Conference HWWE 2007	Bhopal	10-12-2007	Shri V.G. Arude Shri S.K. Shukla
17.	48th Annual Conference of AMI	Chennai	18-12-2007 to 21-12-2007	Dr. N. Vigneshwaran
18.	Seminar on Latest Trends in Nanotechnology	Mumbai	5-1-2008	Shri Virendra Prasad
19.	First International Conference on Agrochemicals Protecting Crop, Health and Natural Environment	New Delhi	8-1-2008 to 11-1-2008	Dr.(Smt.) Sujatha Saxena
20.	National Level Training of Trainers (NLTT) on Refresher Course of TOF Master Trainees	Hyderabad	10-1-2008	Dr. S. Sreenivasan
21.	International Symposium on Jute and Allied Fibres Production, Application and Marketing	Kolkata	10-1-2008 to 12-1-2008	Dr. R. P. Nachane
22.	Continuum Source AAS – Contr AA	Mumbai	24-1-2008	Shri R.R. Mahangade
23.	49th Joint Technological Conference of ATIRA, BTRA, SITRA and NITRA	Mumbai	1-2-2008 and 2-2-2008	Dr. S. Sreenivasan Dr. R.H. Balaubramanya Shri Achchhelal Yadav

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Sr. No.	Meetings / Conferences / Seminars / Symposia, etc.	Place	Date	Participants
24.	42nd ISAE Convention and Symposium	Bhopal	1-2-2008 to 3-2-2008	Shri V.G. Arude Shri S.K. Shukla
25.	Competitiveness of Indian Paper Industry in Global Scenario	Kolkata	8-2-2008 and 9-2-2008	Dr. A.J. Shaikh
26.	Futuristic Textiles	Kanpur	9-2-2008 and 10-2-2008	Shri Chitranayak
27.	Workshop on IPR Policy & Issue	Kerala	18-2-2008 to 20-2-2008	Dr. R.P. Nachane Shri A.K. Bharimalla
28.	3rd International Workshop on Crystallization, Filtration and Drying	Mumbai	21-2-2008 to 23-2-2008	Dr. N. Vigneshwaran
29.	Training Need and Analysis for Innovation in Agriculture	Lucknow	27-2-2008 to 29-2-2008	Dr. R.P. Nachane

## Workshops, Seminars, Summer Institutes, Farmers' Day, etc. Organised by CIRCOT

### National Seminar on Emerging Potential of Cottonseed and its By-products

The Indian Society for Cotton Improvement in collaboration with CIRCOT and All India Cotton Seed Crushers Association (AICOSCA) organized a one-day National Seminar on Emerging Potential of Cottonseed and its By-products on April 10, 2007 at Jubilee Hall, CIRCOT. India is losing cottonseed by-products worth about Rs.2500 crores every year including about 5

lakh tones of cottonseed oil and that too at a time when about 50% of our vegetable oil requirement is met through import. With this background, this seminar was organized to provide a platform for the concerned organizations to deliberate and formulate strategy for gainful utilization of cottonseed and its by-products.

Dr. S. Sreenivasan, Director CIRCOT welcomed the gathering, introduced the Chief Guest Dr. Mangala Rai, Secretary DARE



*Dr. Mangala Rai, Secretary, DARE and Director-General, ICAR delivering a lecture on the Status of Cottonseed Utilisation in India*

and Director General, ICAR and gave a brief introduction on the status of utilization of cottonseed and its by-products in India. Four informative booklets were released on the occasion. Dr. R.H. Balasubramanya, Chairman, ISCI during his address requested Dr. Mangala Rai for inclusion of oil content as one of the criterion in cottonseeds during the variety release. Shri. O.P. Goenka, Director, M/s. Food, Fats & Fertilizers Ltd., Hyderabad presented the keynote address with a focus on the relative status of oil palm in comparison with cottonseed oil. Shri Sandeep Bajoria, Chairman, AICOSCA presented the status of cottonseed oil in India with special emphasis on its increasing use in Gujarat. He also requested that the importance of cottonseed oil be emphasized in the Government policies. Dr. Nawab Ali, DDG (Engg), ICAR briefly introduced the need for incorporation of cutting edge technologies like Nanotechnology and Biotechnology for enhancing the utilisation of cottonseed by-products.

Dr. Mangala Rai in his inaugural address expressed the view that the introduction of Bt. gene has no effect on the yield of cottonseed oil as pointed out by some speakers and that the cottonseed and lint are not mutually exclusive, genetically. Though India grows all the four species of cotton and is considered as a country incurring lower cost for production, absence of scientific processing and handling of cottonseed comes in the way for farmers to gain income from by-products. He also pointed out the need for preparing a road map and strategy with public-private

interaction for proper utilization of cottonseed by-products in future. Dr. P.V. Varadarajan, Secretary, ISCI proposed a vote of thanks to all those involved in the organization of this seminar.

The inaugural session was followed by three technical sessions that dwelt with cottonseed oil production scenario, utilization and value addition to cottonseed by-products and roadmap of cottonseed utilization in India. Based on the daylong deliberation, a few researchable issues were identified to harness the potential of cottonseed and its by-products. The targets set for the future consists of improving the oil recovery by 20%, promotion of varieties that have no gossypol in seeds, production of bio-enriched products from hull and exploring various uses of linter and modernisation of the processing units.

#### **Review Meeting of the CFC Funded Project on Utilisation of Cotton stalks for Value Added Products**

The third Review Meeting of the CFC funded project on Utilisation of Cotton Stalks for Value Added Products was held on May 25, 2007 at GTC, Nagpur under the Chairmanship of Dr. S. Sreenivasan, Director, CIRCOT. Before the commencement of the meeting, the members were taken to M/s. Shivdhan Boards, Borkhadi, a particle board industry having a capacity of 45 TPD run with bagasse as the sole raw material and with indigenously installed machinery. The members were then taken to ITPD Demonstration plant set up under the CFC programme at GTC, Nagpur where a 160 KVA Gen Set, the boiler and dust collection system were installed recently.



Subsequent to the welcome address delivered by Dr. S. Sreenivasan, Dr. R.H. Balasubramanya, Principal Scientist and Head, Chemical and Biochemical Processing Division made a presentation on the logistics of cotton stalk supply chain, cotton stalks cleaning system, standardisation trials at the demonstration plant, soft board trials, briquetting trials, etc. A detailed techno-economic feasibility proposal for a 20 TPD plant was also presented. During the discussions Dr. R.P. Kachru, Former ADG (PE), suggested the following.

- Dust emission in the plant be kept minimum
- Formaldehyde emissions be thrown out efficiently
- Workers to be provided asbestos gloves even during chipping
- Technology pricing to be kept ready to enthuse prospective entrepreneurs
- Scale of economy of the plant to be found out based on specificity to different cotton zones including Afro-Asian countries
- Alternate raw materials to be identified
- Risk Analysis to be made and corrective measures to be given.

Mr. V.S. Raju, CMD, Ecoboard Industries Ltd., based on his experience in the Board industry suggested the following.

- The raw material cost to be kept low to enthuse existing industry and also to bring in new entrepreneurship. The

uprooting cost of cotton stalks to be borne by the farmers.

- Excise duty to be exempted for products from crop residues to promote its utilisation by the board industries. The Government of India needs to be approached and convinced in this regard.
- Highlight the additional income generation to farmers.
- The size of the plant to be decided based on ROI and hence could be arrived at by mutual discussion with experts from Board Industries.
- The proposal to be got evaluated through a Chartered Accountant.
- The investment on putting up a particle board factory is high and hence the Govt. to be requested to levy a special low interest rate to prospective entrepreneurs employing crop residue.
- All-out efforts to be made with the involvement of ICAR and concerned ministry to see that crop residues are put to value addition.

Dr. B.M. Khadi, Director, CICR, Nagpur informed the members that even today cotton stalk is being used as fuel and in some places, charcoal is prepared from stalks. He apprised that in Gujarat, stalks are being incorporated in the soil by running cotton stalk slashers. He suggested that the values given in the flow chart with regard to cotton stalk be checked and expressed on moisture free basis to avoid confusion.

Dr. Pitam Chandra, ADG (PE) suggested quantification of dust generation in the plant. He requested that the exact quantity of cleaned chips required to make the boards is to be indicated and suggested to approach the Ministry of Environment and Forests to convince the benefits of using crop residues for setting up particle board industries.

The meeting ended with a vote of thanks by Dr. K.M. Paralikar, Head, Technology Transfer Division.

### ICAR Foundation Day

ICAR foundation day was celebrated on 16th July 2007. During this occasion, various activities were organized for the benefit of staff members and an exhibition was arranged for the public at large.



*Shri Ashok Kumar Bharimalla, Scientist, explaining the research activities to students and visitors in the exhibition at CIRCOT during ICAR Foundation Day*

Students from nearby colleges visited the exhibition and also witnessed a live demonstration of CIRCOT's technologies.

### NAIP Stake Holders Workshop Under Component 2

A half-day workshop was organised by CIRCOT to interact with various stake

holders under the proposed NAIP project entitled *A Value Chain for Cotton Fibre, Seed and Stalks : An Innovation for Higher Economic Returns to Farmers* on July 20, 2007 at the Jubilee Hall of the Institute.

Shri Suresh Kotak, Chairman, Kotak Research Foundation and a well-known



*Dr. S. Sreenivasan, Director, CIRCOT during the Introductory Speech at NAIP Stakeholders Workshop*

personality in the field of cotton textiles was the Chairman of the Workshop. Dr. J.P. Mittal, National Coordinator, NAIP, New Delhi, Dr. Pitam Chandra, ADG (P.E.), ICAR, New Delhi, Dr. K.R Krishna Iyer, Former Director, CIRCOT and presently Consultant, CCI, were the experts on this occasion. The workshop was well attended by eminent persons from textile trade and industry, former Directors from CIRCOT and CICR, Nagpur, Scientists from CICR, Nagpur, CoPIs from Super Spinning Mill, Coimbatore, and Natural Dye Resources, Mumbai, Scientists and Technical Officers from CIRCOT, etc. Dr. R.P. Nachane, Principal Scientist and Head, Quality Evaluation & Improvement Division, CIRCOT and Principal Investigator of the project dwelt at length on the consolidated proposal made in consultation with all the stake holders. He categorically identified

the key technology gaps in the supply chain between the farmer and the end user, the likely intervention at different stages in order to fill-in the existing gaps so that the chain becomes stronger and viable. The following were some of the points that emerged after the discussion.

- To reduce the trash content further down i.e below 1 %.
- To stress the importance of manual picking of cotton to farmers as this is the best practice.
- Demonstrate appropriate picking models to the farmers to reduce the contamination and to avoid picking of yellow bolls.
- Processing is the weak link in cotton value chain and hence needs to be addressed seriously.

- Use of natural dyes as UV absorbers in textiles and as a means of value addition and employment generation in rural areas to be stressed upon.

#### **Interactive Workshop under NAIP for Component 4**

A two-day workshop was organised during January 8 and 9, 2008 at Mumbai by the Project Implementation Unit of National Agricultural Innovation Project to interact with the various stake holders in which the CIRCOT proposal entitled *Synthesis and Characterization of Nano-Cellulose and its Application in Biodegradable Polymer Composites to Enhance Their Performance* under Component 4 was discussed. The consortium partners for the CIRCOT

proposal from the Tata Institute of Fundamental Research (TIFR) and Mumbai University Institute of Chemical Technology (MUICT) participated in the Stakeholders workshop.

Besides the above, four other proposals from different institutes were also discussed in this forum. Dr. A. Bandyopadhyay, National Coordinator NAIP, Component 4, presided over the workshop. On the first day, discussions were carried out with the respective experts which was followed by presentation of proposals by the principal investigators of different projects on the second day. The following were the important recommendations on the proposal:



*Discussions during NAIP Stakeholders Workshop*

- It is necessary to evaluate cotton plant by-products like cotton liners for production of nanocellulose.
- Explore the use of biopolymers for the preparation of biodegradable nanocomposites.
- It is important to develop in-house expertise for fractionation of enzyme and its immobilization at CIRCOT.

#### **Mid term Review of the CFC Funded Project on Utilisation of Cotton stalks for Value Added Products**

A mid-term review of the project was carried out during November 2007 by the team appointed by CFC led by Mr. Sanjeev Vasudev with team members, Dr. Virender Khatana and Mr. Shanti Mansobdar along with Dr. G. B. Ayoola, from Nigeria a

representative from CFC, Netherlands . The team visited Sirsa, GTC, Nagpur, Umri Wagh (a village near Nagpur), CIRCOT, Mumbai, M/s. Western India Plywood Industries Ltd., Cannanore and M/s. Ecoboard Industries Ltd., Velapur and submitted the report. The following are the major recommendations.

- To Identify an agent in the rural area to act as a nodal person in the cotton stalk supply chain
- To carry out a market survey of particle board industry especially that of cotton stalk based raw material in India.

It was suggested that, the project could be extended to cover the above two items. In addition, the study could also cover the following areas:



*CFC Members during Discussion*

- Biomass needs for utilization in the power and paper sector and variable price points, particularly for bagasse and cotton stalk
- Small land holders to get more benefit for collection of cotton stalk from their fields as against larger land holders
- Evaluating the response of small farmers for their willingness to forego their needs of biomass for fuel to cash and meeting their needs from other sources.

Other key points that emerged from the review are :

- To quickly establish a viable supply-chain mechanism under Component I.
- To involve a private player to lift cotton stalks from the field to board production units, if possible.
- Material loss due to transportation to be compensated from other options available to generate returns from waste to be explored.
- Need to have a fresh look into bailing and compaction efficiencies in order to beat the cost inefficiencies arising out of transportation and storage.
- Need to impress upon the government to lower excise duty on cotton stalks or at the most making it *on par* with bagasse in the interest of cotton farmers.
- Need to update market information and to conduct consumer trials.
- Conducting awareness meets, developing web-site, email, newsletter and literature sharing for building confidence in using cotton stalks as raw

material in the minds of not only the existing players but also those within the wood/wood substitute industry

- Clearly establish the competitive edge of cotton stalks as raw material for particle board production against other available agro waste and wood waste.

#### **Awareness Meets**

- An awareness meet was organised on ginning and demonstration for preparation of particle board at GTC, Nagpur on April 28, 2007. During this meet, a software prepared for maintenance of the ginning industry was presented by Smt. Acushla Antony and Dr. R.H. Balasubramanya, presented the technologies on by-product utilisation. The meet was attended by trade, industries, R&D organisations and farmers.
- An awareness meet on the demonstration of cotton stalk collection and chipping was arranged at Sirsa on November 21, 2007. This meet was arranged in the presence of the Mid term review team of CFC funded project. In this region, a centralized cotton stalk collection system already exists. The wet stalks were chipped with a help of a chipper run on power drawn from a tractor. It was found that it is possible to chip about 10 tons of stalks in 8 h time.
- The awareness meet at Umri (Wagh) on November 24, 2007 was attended by around 75 farmers in which the importance of cotton stalks was highlighted. Importance of clean

picking of cotton, ginning and demonstration of particle board preparation were stressed to the farmers. There was also a demonstration of cotton picking to the farmers. The farmers expressed that a chipper needs to be provided in the beginning to kick start the process.

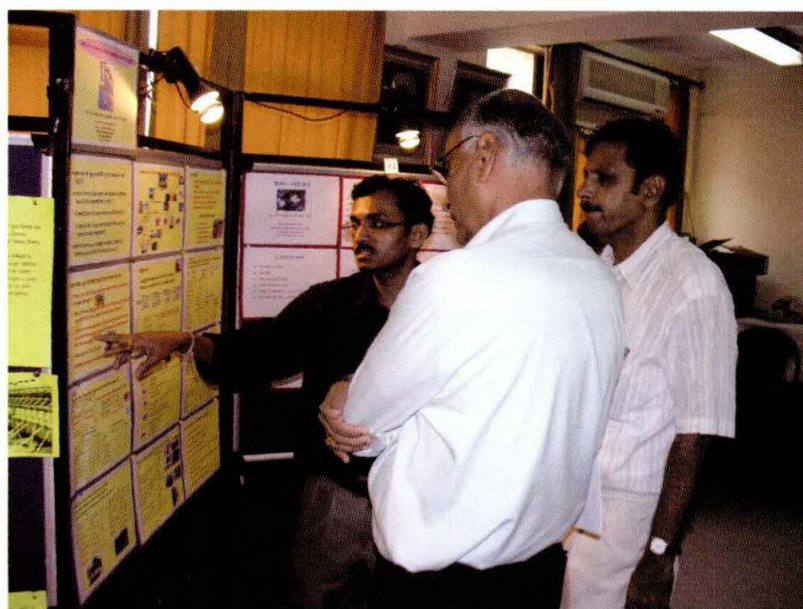
- An awareness meet on ginning and demonstration of particle board preparation from cotton plant at Guntur on February 23, 2008.
- At awareness meet at Udumalpet near Pollachi (Tamil Nadu) on March 5, 2008 emphasis was made on the importance of certified seeds, agricultural and agronomic practices, importance of clean cotton picking, on-farm storage of cotton stalks, transportation and use of cotton stalk for value added products

to get additional income to the farmers. The farmers also felt that a machine for uprooting of cotton plant stalks is required. The farmers expressed that in the light of high labour cost, all the other positive factors are not enough to attract them to carry out the work. In the meet it was noted that the expectation of the farmers was much more higher; sometimes looked as if it is beyond the service provided by them.

- An awareness meet on clean cotton picking and demonstration to the farmers on uprooting and chipping of cotton stalk at Khadka (Jaipur) in Sailu Taluk, Wardha District on March 18, 2008.

#### **Hindi Day / Fortnight Celebration**

Hindi day/fortnight was celebrated at the Institute from 5th to 14th September,



*Poster presentation during Hindi day*

2007. The celebrations were inaugurated by the Chief Guest Dr. Suresh Sharma, Senior Assistant Editor, Navbhart Times on September 5, 2007. On this occasion two competitions, viz. 'Aashubhashan' and 'Kavita Pathan' were held. Dr. R.H. Balasubramanya, Acting Director presented the welcome address.

During the ten days that followed, various competitions like Technical Vakyansh, Essay-writing, Phrases and their uses, Poetry Composing, Cross-Word, Bees Sawal, Poster Presentations, Antakshari, etc. were conducted and more than 100 staff members took active part in the contests.

The closing day function of the celebration was presided over by Dr. Indira Shukla, Principal, Gokhale College of Education and Research. Dr. A.J. Shaikh, Chairman, Hindi Organizing Committee presented a brief account of the competitions held in the Institute during the ten days. Dr. R.H. Balasubramanya, Rajbhasha Adhikari, read out the proceedings of various activities carried out and progress made in implementation of official language during the year.

#### **Hindi Week Celebration at GTC, Nagpur**

The Hindi Week was celebrated at GTC, Nagpur from 14th to 20th September 2007 with great enthusiasm. The Chief Guest for the inaugural function was Mr. Dinesh Chandra Sharma, Assistant Director (OL), Hindi Training Scheme, Nagpur and Special Guest Dr. Mahendra Kumar Shahu, Senior Hindi Translator, National Bureau of Soil Survey and Land Use Planning. Subsequent to inauguration on 14th September, various

competitions like geet gayan, phrases and their uses, noting-drafting, essay writing, etc. were conducted. Twenty-two staff members took active part in the contests.

The closing day celebration was presided over by two special guests, Dr. S.G. Gupta, Principal Scientist of National Research Centre for Citrus and Shri Sachin Agnihotri, Administrative Officer from National Bureau of Soil Survey and Land Use Planning.

#### **Hindi Workshop**

A Hindi workshop was held during August 3 and 4, 2007 at CIRCOT for all Technical Officers. Shri Harshmohan Krishna was the chief guest. The topics for discussion were "Vigyan Avam Takniki Ke Paripekha Main Bharatiya Bhashaye" and "Karyalayeen Hindi Avam Vyavaharik Kathinaiyen". Technical officers were benefited by participation in the workshop.

#### **Communal Harmony Week**

The communal harmony week was celebrated during November 19 – 25, 2007. On November 19, all staff members took oath. On November 23, Shri Rajnish Sheth IPS (ACP) delivered a lecture on communal harmony.

#### **Vigilance Awareness Week**

The Vigilance Awareness Week was celebrated from November 12 to 16, 2007. Dr. R.H. Balasubramanya, Director-Incharge inaugurated the function on 12th November. Dr. Dhananjay Vanjari (ACP, ATS, Mumbai) delivered a lecture on Corruption and the





*Hindi Workshop for Technical Officers*



*Shri Rajnish Sheth, IPS (ACP) on  
Communal Harmony*

ways to prevent it. On 13th November, Shri Vikas Wagh, Police Inspector (ACB) delivered a lecture on Vigilance and Corruption.

On 14th November, Shri S.P. Singh, DSP (CBI, ACB) gave a lecture on Vigilance

and emphasized that both taking and giving bribe are crime. On the same day, an essay competition was held regarding Vigilance. Staff members were allowed to write in Marathi, Hindi and English. Apart from Scientists, staff members from Technical, Administration and Supporting category



*Shri Dhananjay Vanjari (ACP, ATS, Mumbai) on  
ways to prevent corruption*

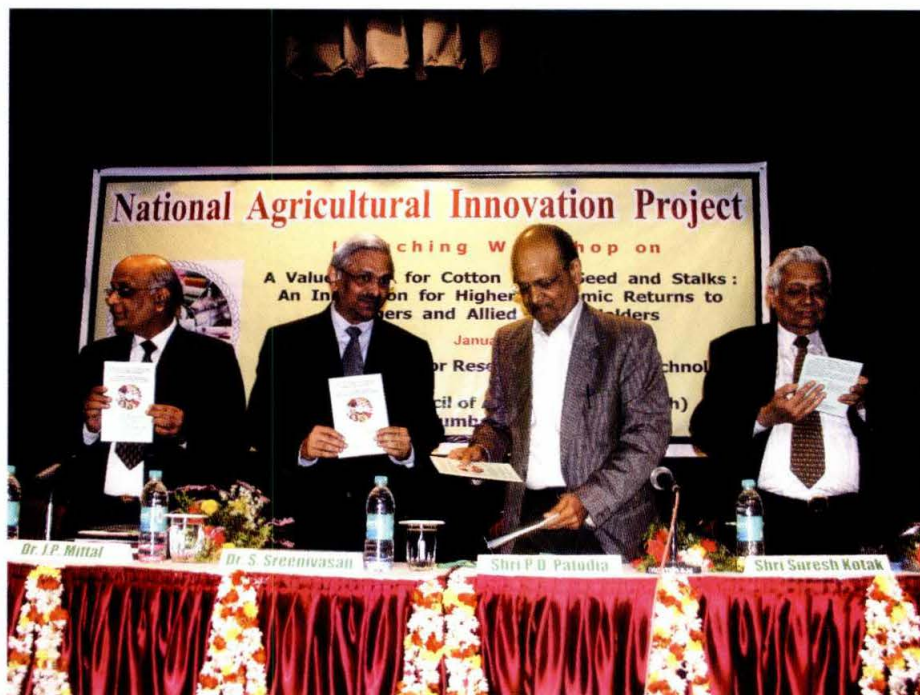
participated actively in this competition. On the closing day, Shri Dhananjay Vanjari (ACP, ATS Mumbai) attended and made closing remarks.

### NAIP launch workshop

The project on **A Value Chain for Cotton Fibre, Seed and Stalks: An Innovation for Higher Economic Returns to Farmers and Allied Stake Holders** under Component 2 of National Agricultural Innovation Project was officially started on December 15, 2007. A launch workshop held on January 9, 2008, was inaugurated by Shri P.D. Patodia, Chairman, Confederation of Indian Textile Industries (CITI) Mumbai and attended by eminent personalities from industry, trade and research organizations. Dr. J.P. Mittal,

National Coordinator (NAIP) for Component 2 introduced NAIP to the audience and Dr. R.P. Nachane, Consortium Principal Investigator of the project, gave a brief account of the work envisaged up to 2011. In the discussions that followed, Dr. K.R. Krishna Iyer, former Director, CIRCOT expressed the view that in the project, ginning has not been included as an activity and there was also a suggestion to prepare bioenriched fish food from cottonseed meal which would further add value addition to cotton and would bring extra remuneration.

The first Consortium Advisory Committee (CAC) meeting was held on January 9, 2008 under the chairmanship of Shri Suresh Kotak, President, Kotak & Company. Seven members of CAC and two invitees were present in the meeting.



*Shri P. D. Patodia, Confederation of Indian Textile Industries (CITI), Mumbai releasing the Value Chain for Cotton Fibre, Seed and Stalks: An Innovation for Higher Economic Returns to Farmers and Allied Stake Holders*

## CONFERENCES, MEETINGS, WORKSHOPS AND SYMPOSIA

Director, CIRCOT and Dr. R.P. Nachane, CPI of this project briefed all the members about the project. In the discussion that followed the following points emerged :

- CIRCOT needs to bring out do's and don't's regarding on-farm and off-farm practices for producing clean cotton in various vernacular languages.
- To keep the produce of each picking separately and process them individually, as the trash content and fibre characteristics are expected to vary with different pickings. Once the results of the pickings from the same crop are made available, standardization about segregation of cotton can be made.
- Trash content should be determined for each bale.

- Dissemination of information on good ginning practices as well as cotton parameters - based adjustments in ginning machineries to help in realizing better quality lint.
- Contamination of the yarn reduces the price of yarns by about 1\$/kg of yarn.
- Leaf-lets, films, CDs, etc. should be made available through the project as dissemination material.

### **Review meeting of Network Project on Ramie**

A meeting was held at CIRCOT to review the progress of the network project on Ramie on February 25, 2008 under the Chairmanship of Dr. H.S. Sen, Director, CRIJAF, Barrackpore. Apart from scientists from CIRCOT, members from other partner Institutions, ICAR Research Complex (Goa),



*Dr. H. S. Sen, Director, CRIJAF, Barrackpore and Chairman,  
Network Project on Ramie in discussion with Dr. R. H. Balasubramanya, HOD, CPBD*

Konkan Krishi Vidhyapeeth (Dapoli) and TNAU (Coimbatore) participated in this meeting. The progress of the project was reviewed in detail at the meeting. The best package of practices to grow ramie crop at Ooty, Dapoli and Goa have been worked out. Decorticated ramie fibres subjected to biological degumming were spun, woven and garments were made. These were shown to all the members.

### National Science Day

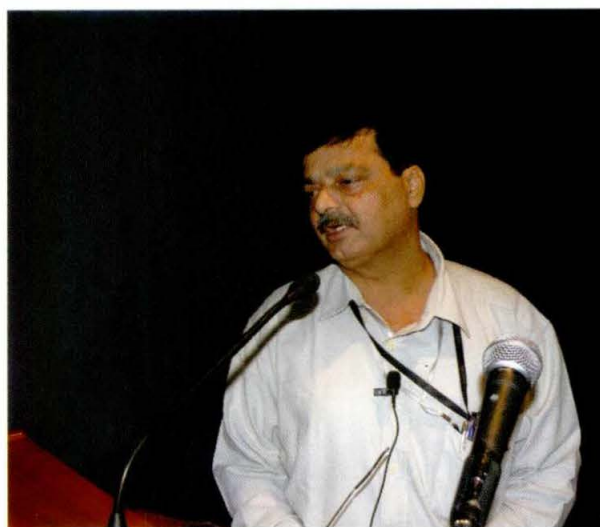
To commemorate the discovery of Raman Effect by the Indian Physicist and Nobel Laureate Sir C.V. Raman, every year February 28 is celebrated as the National Science Day as per the directives from the Government of India. The main aim of the celebration is to popularize science and develop scientific temperament among the public at large. On this occasion, Shri Chandrasekhar, Editor, Hindu Businessline delivered a lecture on the **Role of Technology in Agriculture** which was well attended by the staff of the Institute.

### International Women's Day

On the occasion of International Womens' Day Dr. C.S. Lakshmi, Director, Sound and Picture Archives for Research on Women (SPARROW), Dahisar gave a talk on the work carried out by her organization. On this occasion a film on the crusade of Smt. Shahjaha Apa against Dowry and Harassment against women was screened. The function was organised at the Jubilee Hall on March 10, 2008. Winners in various events at the ICAR Zonal Sports meet held at Jodhpur were felicitated on this occasion.

### Internal Seminars

- *Cotton in Egypt* by Dr. R.P. Nachane, Principal Scientist and Head, QEID, CIRCOT on October 11, 2007.
- *Evaluation of Protective Clothing for Pesticide Applications* by Dr. (Smt.) Sujata Saxena, Sr. Scientist, CIRCOT on October 11, 2007.



*Dr. R.P. Nachane, Principal Scientist and Head, QEID on Cotton in Egypt*



*Dr. (Smt.) Sujata Saxena, Sr. Scientist on Evaluation of Protective Clothing for Pesticide Applications*

## CONFERENCES, MEETINGS, WORKSHOPS AND SYMPOSIA

- *Introduction to Weibull Distribution* by Prof. V. Subramanyam, Director, Jaya Engineering College, Chennai and Chairman, QRT, CIRCOT on December 11, 2007.
- *Application of Bio-technology in Agriculture* by Dr. T.K. Siddharam Gowda, Director of Instructions (PGS), University of Agricultural Sciences, Bangalore and Member, QRT, CIRCOT on December 11, 2007.
- *Report on Deputation to Geneva* by Dr. S. Sreenivasan, Director, CIRCOT on January 29, 2008.
- *Hindi Main Kamkaj* by Shri Suresh Jain, Hindi Officer, National Industrial Institute of Engineering Technology, Mumbai on March 10 and 11, 2008.
- *Glimpses of Cotton Production and Technology in Egypt* by Dr. S.K. Chattopadhyay, Principal Scientist, CIRCOT on March 11, 2008.
- *Preparation of Particle Board from Cotton Stalk* by Dr. K.M. Paralikar, Head, Transfer of Technology Division and Shri R.M. Gurjar, Principal Scientist, CIRCOT on March 11, 2008.

## Distinguished Visitors

1. Shri Jafar Mohmood, Secretary, Textile, Govt. of Pakistan
2. Dr. (Prof.) G.B. Ayoola, University of Agriculture, Makurdi, Nigeria, a representative from CFC, Netherlands
3. Shri Sanjeev Vasudev, Head, CFC Mid-Term Review Team
4. Shri Kantilal Bhuria, Hon. Minister of State for Agriculture
5. Shri Pravin Kakkad, Officer on Special Duty to Minister of State for Agriculture
6. Shri A.K. Upadhyay, Additional Secretary, DARE & Secretary, ICAR, New Delhi
7. Dr. Rita Sharma, Additional Secretary and Financial Advisor, DARE, ICAR
8. Dr. Pitam Chandra, ADG (Process Engg.), New Delhi
9. Dr. Sanjay Gupta, Professor & Head, National Institute of Fashion Technology, New Delhi
10. Dr. Anupam Barik, Director, Directorate of Cotton Development
11. Dr. R.T. Patil, Director, CIPHET, Ludhiana



*Shri Kantilal Bhuria, Hon'ble Minister of State for Agriculture during the visit to CIRCOT*



*Dr. Rita Sharma, Additional Secretary and Financial Advisor, DARE, ICAR at the exhibition at CIRCOT*

12. Shri H.C. Pathak, Director (Finance), ICAR, New Delhi
13. Shri K.P. Sharma, Asst. Director, Official Language Implementation Office, Mumbai

## Infrastructural Facilities

**Library :** Besides the publications connected with cotton research, books of general interest have been constantly added to the library collection.

During 2007 – 2008, 261 new books were added to the library. This consisted of 146 books in Hindi, 115 books in English (49 books from the NAIP funding).

The total number of books by the end of March 2008 rose to 6290. With the addition of 50 bound volumes, the total number of journals stood at 7746. Out of 66 journals subscribed 41 were Indian publication and 25 foreign publication. Many journals were also received as complimentary or on exchange basis. The total financial outlay for the library during 2007 – 2008 was Rs. 17 lakh of which Rs. 15 lakh was from the Institute plan funds and Rs. Two lakh from the NAIP funded projects. Four CDROM Database of ASTM and BIS standards, AATCC and World Textile Abstracts were also added.

The facilities of the library are being utilized not only by the staff of the Institute but also by the students and researchers from various colleges affiliated to Mumbai University, sister research institutions and personnel from the textile industry. Inter-

library loan arrangements were also maintained with other libraries in Mumbai. Xerox service is provided to the visitors on request for a prescribed charge.

During the reporting period the following major equipment were procured.

- ◆ Textile Appearance Viewing System
- ◆ Trash Separator for Trash Analysis
- ◆ Oil Less Air Compressor
- ◆ Shaker Water Bath
- ◆ Positive Clearers Roller System for LRDO/ 2 Draw Frame
- ◆ Positive Clearers Roller System for Micro Draw frame
- ◆ Computerized Lea Tester for Microspinning
- ◆ Automatic Roving Bobbin Cleaner
- ◆ Material Transport Pipeline
- ◆ Linking Machine
- ◆ Inclined Spiked & Feed Lattices for Blow Room
- ◆ Roller and Clearer Type Carding Opener
- ◆ Filter Unit for Blow Room

# 13

## Personnel

Major events during 2007-2008 relating to CIRCOT personnel are listed below:

### A. PROMOTIONS

Sl. No.	Name	Post to which Promoted	Effective Date of Promotion
<b>Scientist</b>			
1.	Shri Chitranayak	Scientist (Sr. Scale)	30-06-2006
<b>Technical</b>			
1.	Dr. S.J. Guhagarkar	Technical Officer T- (7-8)	3-2-2005
2.	Dr. (Smt.) A.A. Kathe	Technical Officer T- (7-8)	3-2-2005
3.	Shri P.K. Mandhyan	Technical Officer T- (7-8)	3-2-2005
4.	Shri D. Radhakrishnamurthy	Technical Officer T- (7-8)	3-2-2005
5.	Shri K.B. Rajagopal	Technical Officer T- (7-8)	3-2-2005
6.	Shri S. Sekar	Technical Officer T- (7-8)	3-2-2005
7.	Smt. R.K. Shahani	Technical Officer T- (7-8)	3-2-2005
8.	Dr. S. Venkatakrishnan	Technical Officer T- (7-8)	3-2-2005
<b>Administrative</b>			
9.	Shri S.N. Salve	Assistant Administrative Officer	2-7-2007
10.	Smt. Sujatha Koshi	Assistant Administrative Officer	27-11-2007
<b>Supporting</b>			
11.	Shri A.R. Chutale	SS. Gr. II	3-12-2007
12.	Shri M.G. Bhandakkar	SS. Gr. II	3-12-2007



PERSONNEL

**B. TRANSFERS**

1. Shri S.N. Hedau, Technical Officer T-5 from CIRCOT Headquarters to GTC, Nagpur w.e.f. 22-5-2007.
2. Shri Sanwormal Saini, Technical Assistant, T-1 from CIRCOT Headquarters to CIRCOT Regional Quality Evaluation Unit, Sirsa, w.e.f. 1-9-2007.

**C. RETIREMENTS**

***Scientist***

1. Smt. Prema Nair, Sr. Scientist retired voluntarily on 31-05-2007.
2. Dr. G.F.S. Hussain, Principal Scientist retired on 30-06-2007.

3. Shri M. Ahmed, Principal Scientist retired on 31-07-2007.

***Technical***

1. Shri Gian Singh, Technical Assistant T-1 retired on 31-10-2007.
2. Shri G. Viswanathan, Technical Officer, T-(7-8) retired on 31-03-2008.

***Administration***

Shri M.Z. Bhagat, Assistant Administrative Officer retired on 30-06-2007.

***Supporting***

Shri T.B. Khan, Supporting Staff Gr.III retired on 30-06-2007.

**E. TRAINING**

<b>Sl. No.</b>	<b>Name of the Training Programme</b>	<b>Period and Place</b>	<b>Participant(s)</b>
1.	Professional Development (Workshop) for Private Secretaries	April 16 – 20, 2007 ISTM, New Delhi	Shri Venu Thanikal
2.	All India Convention on Right to Information Act - 2005	June 15 – 16, 2007 IIPA, Bangalore	Shri M.B. Khubdikar Smt. M.V. Kamerkar
3.	National Convention on Post Based Roaster	July 2 – 4, 2007 IIPA, Bangalore	Shri M.B. Khubdikar Smt. M.V. Kamerkar
4.	Workshop on Pensions and other Retirement Benefits	July 16 - 20, 2007 ISTM, New Delhi	Shri S.V. Kasabe
5.	Workshop on Official Language	Aug. 31 – Sept. 1, 2007 IIPA, Bangalore	Shri M.B. Khubdikar Smt. T.P. Mokal
6.	Finance Management	September 19 – 21, 2007 Centre for Training and Social Research, New Delhi	Shri S.V. Kasabe Shri J.R. Mangale
7.	AUTOCAD	September 4 – 24, 2007 IDEMI, Mumbai	Shri Ashok Kumar Bharimalla
8.	Seminar on Purchase Policy & Procedure in Government Department	November 21 – 23, 2007 Centre for Training & Social Research, New Delhi.	Shri K.W. Khamkar Shri S.N. Bandre
9.	Seminar on EPF Pension EDLI & other Retirement Benefits	November 28 – 30, 2007 Industrial Management Academy, Mumbai	Shri M.B. Khubdikar Smt. V.V. Desai
10.	Computer Colour matching for Textile	February, 27 – 28, 2008 Mumbai	Shri R.R. Chhagani
11.	Application of PRA Tools in Agriculture Extension	February 25 – March 1, 2008 Extension Education Institute, Anand	Shri. V.L. Rangari Shri. R.G. Dhakate

## PERSONNEL

### E. ACCOLADES

- Dr. N. Vigneshwaran, Scientist (Senior Scale) was awarded the YOUNG SCIENTIST AWARD - 2007 by the Association of Microbiologists of India during the annual conference of AMI held on December 20, 2007 at IIT Madras, Chennai. This award has been conferred on him in recognition for his contribution in the field of microbial synthesis of nanoparticles and their application onto cotton fabrics.
- Dr. (Mrs.) Sudha Tiwari, T-6 received Rajbhasha Shree Puraskar from Ashirwad, a Literary Socio and Cultural Organization, Mumbai for publication of various research papers in Hindi and receipt of various awards during the years 2002-07 during Rajbhasha Sammelan at Films Division, Mumbai on October 11, 2007.
- Dr. (Mrs.) Sudha Tiwari, T-6 received 2nd Prize for paper entitled "Apashitya



*Dr. (Mrs.) Sudha Tiwari, Technical Officer receiving 2nd prize from Dr. Akhilesh Prasad Singh, Hon. Minister of State in the Ministry of Agriculture and Minister of State in the Ministry of Consumer Affairs, Food and Public Distribution*

*Eavam Akhadya Tel Se Vaiklpik Endhan*" for All India Scientific and Technical Article Competition organized by Kendriya Sachivalay, New Delhi on November 26, 2007.

- Shri Chitranayak, Scientist (Senior Scale) received 1st prize in Essay Competition and Dr. (Mrs.) Sudha Tiwari, T-6 received 3rd prize in the Hindi Sulekh Competition, organized by Town Official Language Implementation Committee at CIFE, Mumbai on World Hindi Day, January 10, 2008.

### Fellowship

- Dr. S.K. Chattopadhyay, Principal Scientist was awarded a Fellowship by the Government of Egypt to undertake training on Egyptian Cotton Production and Technology. He also participated in the training course in "Cotton Production and Technology from April 1 to June 15, 2007 at The Egyptian International Centre for Agriculture (EICA), CAIRO.



*Dr. S. K. Chattopadhyay, Principal Scientist during field visit in Egypt*

### Foreign Deputation

- Dr. R.P. Nachane attended the Programme on "Study in the Field of

Cotton Improvement & Quality Assurance” under ICAR-ARC Egypt Work Plan for 2007-08 from 18 to 31, May 2007 at ARC, Egypt.



*Dr. R. P. Nachane, Principal Scientist during presentation at ARC, Egypt*

- Dr. Sujata Saxena participated in the Training on “Evaluation of Protective Clothing for Pesticide Applications”



*Dr. Sujatha Saxena, Sr. Scientist at University of Maryland Eastern Shore, USA*

during 18-29, June 2007 at University of Maryland Eastern Shore, USA.

- Dr. P.G. Patil attended the World Cotton Research Conference from 10 to 14, September 2007 in USA.
- Dr. K.M. Paralikar and Mr. R.M. Gurjar, Principal Scientists were deputed to attend the Ecocoboard Workshop at Philippines during 1-3 October 2007 to present the research findings on the Utilization of Cotton Plant By-produce for Value Added Products (CFC funded project).
- Dr. S. Sreenivasan, Director, CIRCOT attended the W.T.O. Workshop on Development Aspects on Cotton in Geneva, Switzerland on 22nd November 2007.

#### **ICAR Inter-Institutional Sports Meet**

ICAR Inter-Institutional Sports Tournament (Western Zone) was organized at CAZRI, Jodhpur from March 4-8, 2008. A contingent of 40 sports persons participated from the Institute with Shri Chitranayak, Scientist (Senior Scale) as Chief-de-Mission and Shri J.R. Mangle, Senior Clerk as Manager. The team actively participated in almost all the sports events, such as Volleyball, Kabaddi, Table Tennis, Chess, Carom, Badminton and in various events of Athletics. The CIRCOT team was awarded the Fair Play Trophy 2008, based on the team’s overall behaviour, conduct, maintaining time-schedules, on and off the ground behaviour, etc. The winners from CIRCOT were:

1. Smt. Smita Paiyala, LDC: 1st in TT Singles, TT Doubles, Badminton Singles & Doubles, and 2nd in Carom & Javelin.

## PERSONNEL



*Smt. Smita Paiyala, LDC being felicitated by  
Director, CIRCOT*

2. Smt. P.S. Nirhali, T-4: 1st in TT Doubles, Badminton Doubles and 2nd in Badminton Singles
3. Smt. K.R. Khaire, Teamaker cum Dish Cleaner: 1st in Carom.
4. Smt. Bharati Kherodkar, LDC: 1st in Shot Put
5. Shri N.V. Kambli, UDC: 2nd in 200 m race
6. Shri N.V. Kambli, UDC; Shri M.G. Ambare T-3; Shri S.P. Naik SSGr-1 and Shri S.S. Surkule SSGr-1: 2nd in 4 x 100 m Relay
7. Shri G.S. Deorukhar T-1-3: 2nd in Carom.

The victorious contingent was felicitated on March 17, 2008 in the Jubilee Hall of the Institute.

**STAFF WORKING AT THE  
CENTRAL INSTITUTE FOR RESEARCH ON COTTON TECHNOLOGY  
AS ON 31-03-2008**

*(List does not include vacant posts)*

**LIST OF STAFF AT THE HEADQUARTERS**

**Scientific Personnel**

*Director*

Dr. S.Sreenivasan, M.Sc., Ph.D., F.T.A., C.Text, F.T.I.

*Principal Scientist & Head of Division*

1. Dr. R. H. Balasubramanya, M.Sc. (Agri.),  
Ph.D., F.T.A., C.Text, F.T.I.
2. Dr.R.P. Nachane, M.Sc., Ph.D. , F.T.A.,  
C.Text., F.T.I.
3. Dr. K.M. Paralikar, M.Sc., Ph.D., F.R.M.S.

*Principal Scientist*

1. Dr. S.K. Chattopadhyay, B.Sc.Tech.(Text.),  
M.Tech.(Text.Engg.), Ph.D. (Tech.),  
F.T.A., C.Engg., F.I.E.
2. Dr. S.G. Gayal, M.Sc., Ph.D.
3. Shri R.M. Gurjar, M.Sc.
4. Dr. A.J. Shaikh, M.Sc., Ph.D.
5. Dr. P.V. Varadarajan, M.Sc., Ph.D.

*Senior Scientist*

1. Dr. D.N. Makwana, M.Sc., Ph.D.
2. Dr. C.D. Ravindran, M.Sc., Ph.D.
3. Dr. (Smt.) Sujatha Saxena, M.Sc., Ph.D.
4. Dr. S. B. Jadhav, M.Sc., Ph.D.
5. Shri D.V. Mhadgut, M.Sc.

## PERSONNEL

### *Scientist (Senior Scale)*

1. Shri K.H. Sawakhande, M.Sc.
2. Dr. N. Shanmugam, M.Tech., MIE, D.T.T.,  
C.Eng., Ph.D. (Tech)
3. Dr. N. Vigneshwaran, M.Sc. (Agri.), Ph.D.

### *Scientist*

1. Shri Ashok Kumar Bharimalla, M.Tech.  
(Agri. Engg.)
2. Shri C. Sundaramoorthy, M.Sc.
3. Shri Achchhelal Yadav, M.Sc.
4. Shri Virendra Prasad, M.Sc.
5. Shri Chitranayak, AMIETE, M.Tech.  
(Electronics)

### **Technical Personnel**

#### *Technical Officer T (7-8)*

1. Dr. S.J. Guhagarkar, M.Sc., Ph.D.
2. Dr. (Smt.) A.A. Kathe, M.Sc., Ph.D.
3. Shri P.K. Mandhyan, M.Sc., A.T.A.
4. Smt. N.D. Nachane, B.Sc.
5. Shri D. Radhakrishnamurthy, M.Sc., M.Phil.
6. Shri K.B. Rajagopal, B.Sc.
7. Shri S. Sekar, B.Sc.
8. Smt. R.K. Shahani, M.A., B.Lib.
9. Smt. S.V. Sukhi, M.Sc., D.F.L.(German)
10. Shri V. B. Suryanarayanan, B.Sc.,  
D.F.L.(German)
11. Shri G. Viswanathan, M.Sc., A.T.A.

#### *Technical Officer T-6*

1. Smt. N.M. Ashtaputre, M.Sc.
2. Shri S. Banerjee, M.Sc.
3. Shri S.M. Gogate, B.Sc.
4. Shri G.B. Hadge, M.Sc.
5. Dr. Matish Chandra, M.Sc., Ph.D.
6. Shri R.M. Modi, S.S.C., Cert. Photography
7. Shri M. Mohan, M.Sc., Dip.J.
8. Shri C.M. More, M.Sc.
9. Dr. R.D. Nagarkar, M.Sc., Ph.D.
10. Dr. E.A. Pachpinde, M.Sc., Ph.D.
11. Shri R.S. Pathare, B.Sc.
12. Shri B.R. Pawar, M.Sc., LL.M.
13. Shri R.S. Prabhudesai, M.Sc., D.C.M.
14. Dr. (Smt.) Sheela Raj, M.Sc., Ph.D.
15. Dr. (Smt.) Sudha Tiwari, B.Sc., Ph.D.
16. Shri S. Vancheswaran, B.Sc.
17. Shri T. Venugopal, B.E.(Civil)
18. Shri M.V. Vivekanandan, M.Sc.

**Technical Officer T-5**

1. Smt. Bindu Venugopal, B.Sc.
2. Smt. Binu Sunil, M.Sc.
3. Shri R.R. Chhagani, M.Sc.
4. Shri B.B. Gaykar
5. Shri R.K. Jadhav, B.Sc.
6. Smt. K.K. Kale, B.A.
7. Shri D.U. Kamble, B.Sc.
8. Smt. S.R. Kawlekar, M.Sc., P.I.M.R.
9. Shri S.V. Kokane, B.A.
10. Shri H.S. Koli, M.Sc., LL.B.
11. Shri R.R. Mahangade, M.Sc.
12. Shri D.N. Moon, B.Sc.
13. Shri P.N. Sahane, D.I.F.T.
14. Smt. N.A. Sonkusle, B.Sc.
15. Shri D.L. Upadhye, SSC (Tech.), D.M.E.,  
N.C.T.V.T.(I.T.I.& C.T.I.)

**Senior Technical Assistant T-4**

1. Shri A.K. Chaphekar, M.Text. (Textile Technology)
2. Smt. P.R. Mhatre, B.Sc., M.Lib.
3. Kum. C.P. D' Souza, M.Sc.
4. Smt. K.R. Joshi, M.A. (Hindi Translator)
5. Shri V.D. Kalsekar, B.Sc.
6. Shri A.P. Modak, B.Text. (Textile Technology)
7. Shri R.S. Narkar, B.Sc., D.C.I.A.
8. Smt. P.S. Nirali, M.Sc.
9. Smt. C.D. Prabha, M.Sc.

**Technical Assistant T-3**

1. Shri M.G. Ambare, M.Sc.
2. Kum. H.G. Narkar, B.A.
3. Shri S. Patil, B.E. (Civil)
4. Smt. L.R. Sonke, B.Sc.

**Category T-1-3**

1. Shri A.R. Bane, Cert. Cot. Spin.
2. Shri M.B. Chandanshive,  
Cert.Cot.Spin.(Machinist/Fitter)
3. Shri G.S. Deorukhkar, Cert. Cot. Spin.
4. Shri B.R. Jadhav
5. Shri D.A. Salaskar
6. Shri C.V. Shivgan, H.S.C., Cert.Wireman,  
Cert.Electrician, Cert.Elec.Supr. (PWD).,  
Cert. M. & A.W.(Technician)
7. Shri S.A. Waghela
8. Shri G.G. Ambare



PERSONNEL

**Category T-2**

- |  |                                       |
|--|---------------------------------------|
| 1. Shri M.Y. Chandanshive                                      | 6. Shri T.S. Mhaske                   |
| 2. Shri D.M. Correia, S.S.C., I.T.I.,<br>N.C.T.V.T. (Mechanic) | 7. Shri M.R. Nevrekar                 |
| 3. Shri R.P. Kadam, B.Sc.                                      | 8. Shri B.K. Sawant                   |
| 4. Shri N.D. Kambli, B.Sc.                                     | 9. Shri S.M. Sawant                   |
| 5. Smt. M.P. Kamble, B.A., B.Lib.                              | 10. Shri S.K. Parab, Cert. Cot. Spin. |

**Category T-1**

- |                     |                       |
|---------------------|-----------------------|
| 1. Shri R.R. Gosai  | 4. Shri D.M. Raje     |
| 2. Shri M.M. Kadam  | 5. Shri N.K. Shaikh   |
| 3. Shri S.G. Phalke | 6. Shri Mahabir Singh |

**Auxiliary Personnel**

**Canteen staff**

Smt. K.R. Khaire (Tea Maker & Dish Cleaner)

**Administrative Personnel**

**Administrative Officer**

Shri M.B. Khubdikar, B.A.

**Finance and Accounts Officer**

Shri R. K. Singh, M.Sc.

**Jr. Accounts Officer**

Shri S. V. Kasabe, B.Com., L.L.B.

**Assistant Administrative Officer**

- |                             |                          |
|-----------------------------|--------------------------|
| 1. Smt. M.V. Kamerkar, B.A. | 3. Smt. S. Koshy, B.Com. |
| 2. Shri K. W. Khamkar, B.A. |                          |

***Assistant***

- |                       |                                      |
|-----------------------|--------------------------------------|
| 1. Shri S.N. Salve    | 9. Smt. T.P. Mokal, B.A.             |
| 2. Shri B.D. Sawant   | 10. Smt. S.M. Desai                  |
| 3. Shri A.B. Dalvi    | 11. Shri A.P. Natu                   |
| 4. Shri D.G. Kulkarni | 12. Smt. J.J. Karanjavkar            |
| 5. Shri B.S. Bhenwal  | 13. Shri K. Parleshwar               |
| 6. Ms. S. Harrison    | 14. Smt. V.V. Janaskar, B.Com., M.A. |
| 7. Smt. V.V. Desai    |                                      |
| 8. Smt. S.D. Ambre    |                                      |

***Private Secretary***

Shri Venu Thanikal

***Personal Assistant***

- |                          |                   |
|--------------------------|-------------------|
| 1. Smt. S.D. Dudam, M.A. | 2. Smt. T.T. Souz |
|--------------------------|-------------------|

***Stenographer Gr. III***

- |                            |                                  |
|----------------------------|----------------------------------|
| 1. Smt. U.N. Bhandari      | 3. Smt. Viniya Rajesh Naik, B.A. |
| 2. Smt. R.R. Tawde, B.Com. |                                  |

***Upper Division Clerk***

- |                                    |                             |
|------------------------------------|-----------------------------|
| 1. Smt. S.R. Shirsat, B.A.         | 5. Shri S.D. Ambolkar       |
| 2. Shri N.V. Kambli                | 6. Shri R.K. Pallewad, B.A. |
| 3. Smt. N.M. Deshmukh, M.A., LL.B. | 7. Shri P.V. Jadhav         |
| 4. Shri J.R. Mangale, B.Com.       |                             |

***Lower Division Clerk***

- |                          |                               |
|--------------------------|-------------------------------|
| 1. Smt. S.G. Parab, B.A. | 6. Shri S.S. Angane           |
| 2. Smt. S.P. Paiyala     | 7. Shri A.R. Gujar            |
| 3. Shri V.M. Sable       | 8. Shri T.D. Dhamange, B.Com. |
| 4. Smt. J.R. Chavkute    | 9. Shri S.N. Bandre           |
| 5. Smt. B.D. Kherodkar   |                               |

PERSONNEL

***Supporting Staff Gr.IV***

- |                       |                     |
|-----------------------|---------------------|
| 1. Shri L.R. Indurkar | 4. Shri R.B. Jadhav |
| 2. Shri M.Z. Rathi    | 5. Shri M.B. Gurve  |
| 3. Shri N.J. Kharat   |                     |

***Supporting Staff Gr.III***

- |                       |                      |
|-----------------------|----------------------|
| 1. Shri O.T. Thapa    | 7. Smt. B.R. Piwal   |
| 2. Shri B.R. Satam    | 8. Shri D.B. Temgire |
| 3. Shri D.M. Chougule | 9. Shri C.S. Salvi   |
| 4. Shri S.D. Gurav    | 10. Shri K.T. Mahida |
| 5. Shri M.K. Ghadge   | 11. Shri P.G. Gogale |
| 6. Smt. T.V. Bhowar   |                      |

***Supporting Staff Gr.II***

- |                         |                          |
|-------------------------|--------------------------|
| 1. Shri M.M. Katpara    | 10. Shri R.P. Karkate    |
| 2. Shri M.A.A. Rashid   | 11. Shri D.G. Gole       |
| 3. Shri G.N. Mayawanshi | 12. Shri C.D. Acharekar  |
| 4. Shri H.B. Vesmiya    | 13. Shri M.K. Prabhulkar |
| 5. Shri M.J. Sumra      | 14. Shri J.D. Sakpal     |
| 6. Shri C.P. Solanki    | 15. Shri V. Murugan      |
| 7. Shri S.K. Bobate     | 16. Shri S.B. Worlikar   |
| 8. Shri P.P. Patil      | 17. Shri S.D. Magar      |
| 9. Shri R.G. Tak        | 18. Shri S.R. Tondse     |

***Supporting Staff Gr.I***

- |                      |                           |
|----------------------|---------------------------|
| 1. Shri V.B. Poojari | 6. Shri D.R. Gawde        |
| 2. Shri S.P. Naik    | 7. Shri S.S. Surkule      |
| 3. Shri M.N. Kamble  | 8. Smt. V.N. Walzade      |
| 4. Smt. K.B. Thapa   | 9. Shri S.M. Chandanshive |
| 5. Shri D.K. Kasar   | 10. Shri P.E. Gurav       |

**LIST OF STAFF AT THE QUALITY EVALUATION UNITS**

**COIMBATORE**

<i>Technical Officer T-6</i>	: Dr. S. Venkatakrisnan, MSc., Ph.D., A.T.A.
<i>Technical Officer T-6</i>	: Shri K. Thiagarajan, M.Sc.
<i>Sr. Technical Assistant T-4</i>	: Shri M. Bhaskar, Dip. Ref. & Air-Cond.
<i>Supporting Staff Grade IV</i>	: Shri V.M. Subramanian

**DHARWAD**

<i>Technical Officer T-5</i>	: Shri K. Narayanan, B.Sc.
<i>Technician T-3</i>	: Kum. V.G. Udikeri, B.Sc.
<i>Supporting Staff Gr.III</i>	: Shri C.J. Bagalkoti
<i>Supporting Staff Gr.II</i>	: Shri A.F. Gudadur

**GUNTUR**

<i>Technical Officer T-6</i>	: Shri S. Mukundan, M.Sc.
<i>Supporting Staff Gr.I</i>	: Shri V. Subbaiah

**NAGPUR**

<i>Scientist (S.G.)</i>	: Shri P.G. Patil, M.Tech. (Post-Harvest Engg.)
<i>Scientist (Sr. Scale)</i>	: Shri Vishnu Govind Arude, M.Tech.
	: Dr. T.S. Manojkumar, M.E. (Agril.), Ph.D., (Agril. Processing)
	: Shri Sujeet Kumar Shukla, M.Tech. (Mech. Engg.)
<i>Scientist</i>	: Smt. Jyoti M. Nath, M.Sc.
<i>Technical Officer T-7</i>	: Shri V.M. Kulmethe, B.Sc.
<i>Technical Officer T-6</i>	: Shri N.V. Bansode, B.Sc.
<i>Technical Officer T-5</i>	: Shri S.L. Bhanuse, B.Sc.
	: Shri U.D. Devikar, B.Sc.
	: Shri R.G. Dhakate, B.Sc.
	: Shri S.N. Hedau, B.Sc.
	: Shri V.L. Rangari, B.Sc.

## PERSONNEL

<i>Technician T-3</i>	: Shri B.V. Shirsath, B.A., I.T.I.
<i>Technician T-I-3</i>	: Shri B.H. Umredkar
<i>Technician T-2</i>	: Shri C.L. Mundale
<i>Technician T-1</i>	: Shri P.S. Panchbudhe, B.A. : Shri H.S. Bhabar : Shri S.V. Kokane
<i>Stenographer (Gr.III)</i>	: Shri R.D. Shambharkar, M.A.
<i>Senior Clerk</i>	: Shri B.D. Dhengale : Shri S.A. Telpande, M.Com.
<i>Supporting Staff Gr.III</i>	: Shri M.P. Tohokar
<i>Supporting Staff Gr.II</i>	: Shri A.R. Chutale : Shri J.P. Patel : Shri R.B. Kautkar : Shri R.G. Matel : Shri R.C. Rokde
<i>Supporting Staff Gr.I</i>	: Shri M.G. Bhandakkar : Shri R.S. Umare

## SIRSA

<i>Technical Officer T-9</i>	: Shri Ram Parkash, B.Sc., LL.B.
<i>Technical Officer T-6</i>	: Dr. Hamid Hassan, M.Sc., Ph.D. : Dr. Jal Singh, M.Sc., Ph.D.
<i>Technician T-1</i>	: Shri Gian Singh : Shri Sanwormal Saini
<i>Supporting Staff Gr.III</i>	: Shri Satyanarayan Gope

**SURAT**

<i>Technical Officer T-5</i>	: Shri G.G. Mistry, B.Sc. : Shri M.B. Patel, B.Sc., L.L.B.
<i>Technician T-2</i>	: Shri J.B. Dhodia
<i>Senior Clerk</i>	: Shri J.I. Parmar, B.Com.
<i>Supporting Staff Gr.IV</i>	: Shri K.M. Rathod
<i>Supporting Staff Gr.II</i>	: Shri M.G. Sosa