CIRCOT

Annual Report 1998-99

केन्द्रीय कपास प्रौद्योगिकी अनुसंधान संस्थान

CENTRAL INSTITUTE FOR RESEARCH

ON COTTON TECHNOLOGY

(भारतीय कृषि अनुसंधान परिषद)

Adenwala Road, Matunga, Mumbai – 400 019

A. R. 1998-99

Preface

The 75th Annual Report of CIRCOT pertaining to the year 1998-99 is being presented to the readers. CIRCOT has completed 75 years since its establishment in 1924. In fact the year 1999-2000 is going to be observed as the ***Platinum Jubilee Year*** *during which it is proposed to organise a series of seminars, workshops and related activities.*

The year under report, namely 1998-99 marked the Golden Jubilee of India's independence. Like all other ICAR Institutes CIRCOT too celebrated the jubilee by organising a few seminars, notable among them being a two day national seminar on ***The Scenario of Cotton and Blended Textiles beyond 2000 AD.*** *Attended by professionals from textile industry, trade and research, the seminar was marked by presentation of 21 papers covering the entire gamut of textile related activities from fibre production to marketing of fabrics.*

CIRCOT has stepped up its public relations and publicity efforts. Better interaction with user groups, effective extension activities, training programmes and commercial testing contracts characterise the new style of the Institute's functioning.

The Laboratories of CIRCOT are being modernised with sophisticated instruments for physical, chemical and biological tests for fibres, yarns and fabrics. The old spinning machinery is being judiciously upgraded for improved efficiency, speed and accuracy without actually replacing them. Buildings are being refurbished with better walls, floor and ceilings.

CIRCOT is seeking accreditation from the National Accreditation Bureau for Testing Laboratories (NABL). Although the initial formalities were over more than a year ago, the accreditation process had to be kept in abeyance on account of building renovation work which is now complete. The final audit by NABL is due to take place shortly. By September 1999 CIRCOT would be an accredited laboratory.

Dr. K. R. Krishna Iyer
Director

Executive Summary

This is the Seventy-fifth Annual Report of CIRCOT covering the period April 1, 1998 to March 31, 1999.

Introduction : CIRCOT was established in the year 1924 under the name of Technological Laboratory of the Indian Central Cotton Committee (ICCC). ICAR took over the administrative control of CIRCOT when all the commodity committees including ICCC were abolished in 1966 and the Laboratory was renamed as Cotton Technological Research Laboratory. To intensify research and re-orient the activities of the Institute in consonance with research priorities of ICAR, new mandates were formulated. On April 1, 1991, the Institute was renamed as Central Institute for Research on Cotton Technology (CIRCOT).

At the headquarters about 2500 cotton samples from various breeding trials were evaluated, while at the Regional Quality Evaluation Units more than 22,000 samples from initial stages of trials were screened for fibre quality. The Institute continued as the co-ordinating centre for technology under the All India Co-ordinated Cotton Improvement Project (AICCIP) and screened over 2,000 samples of cotton for fibre properties and spinning potential.

The total number of books in the Institute library stands at 5061 and of bound volumes of journals at 6648. The Institute continued to be a recognised post graduate institution under the Mumbai University this year, as well.

Under different core areas, twenty-five projects were on-going during 1998-99.

One SRC meeting, one RAC meeting and two Management Committee meetings were held during the reporting period. The QRT Report of CIRCOT for an eleven year period (1986-1996) was submitted to the Director General, ICAR.

The following meetings, workshops, celebrations, etc. were conducted by CIRCOT during 1998-99 :

1. National Seminar on the Scenario of Cotton and Blended Textiles Beyond 2000 AD.
2. Workshop on Eco-friendly Cotton.
3. Seminar on How to Improve Quality of Indian Textiles to meet International Standards ?

A Joint Meeting of Ginners and CIRCOT Scientists.

Highlights of Research Results : The pooled analysis of the data obtained in the study of the effect on fibre qualities and yield levels of cotton due to application of neem products revealed that treatments of neem cake through soil followed by foliar application of neem seed extract was effective in minimising the bollworm infestation as compared to chemical insecticides. Neem products are available locally at cheaper rates. Treatment of neem cake 25 kg/ha at 30 days after sowing (DAS) plus 5% neem seed extract (6 sprays at 10 days interval from 50 to 100 DAS) may be recommended as plant protection schedule for bollworm management.

Under a study on improving fibre properties and yield potential of Asiatic cotton by unconventional breeding methods, four genotypes showing tolerance to pests and performing better in adverse conditions were selected. They were of dwarf type with the anatomical structure of diploid species though tetraploid in origin having chromosome number 2n = 52. Unconventional breeding method was adopted to intergress desirable genes of diploid cotton species into tetraploid and of tetraploid cotton species into diploid species. Most of the selected strains recorded 2.5% span length in the range of superior medium to long staple coupled with promising tenacity as compared to the *hirsutum* hybrid check NHH.44.

The study on the application of AFIS for determining maturity and fineness of different varieties revealed that AFIS can be used to obtain an estimate of Pm relatively fast through measurement of IFC or MR or both. The categorisation of cottons based on AFIS maturity data in vogue needs to be modified. Fibres with IFC over 10% or MR < 0.85 should be considered as immature. The direct method of assessing maturity by caustic soda swelling tends to overestimate maturity when a variety of cotton has large percentage of fibres with wall thickness close to but lower than lumen width. In such cases, maturity measured by AFIS would be more accurate than that measured by caustic soda swelling method. AFIS fineness shows good correlation with Micronaire fineness.

Further modifications on the pneumatic splicer with two baffle plates fitted at the exit of the blasted air from the mingling chamber and with incorporation of a spiral inside the inlet nozzle prior to it were effected under a study on design modifications of pneumatic splicer for improved splicing action. The optimum conditions and settings for the modified splicer were determined. The modified splicer is able to give spliced yarns of good strength with substantially lower cv of breaking strength.

Ginned cotton seeds that were examined in a scanning electron microscope to study the morphology of

cotton seed surface in relation to fibre development and seed coat removal showed that the chalazal cap alone causes seed coat fragments in ginned cotton. Different varieties irrespective of species show large variation in the incidence of chalazal cap removal ranging from 11% to 72% during the ginning process which affects the presence of seed coat fragments in a variety.

In a study on the estimation of fibre maturity from Micronaire value, the following inferences emerged from an analysis of the data collected so far : (i) The perimeter is a varietal characteristic. The variation amongst the samples belonging to a particular variety is as low as 3% or less. (ii) For a given variety Pm bears good relation with Micronaire value with 'r' values being highly significant at 1% level. The same is true for MR from AFIS and Micronaire value. (iv) There exists excellent inverse relationship between IFC and Micronaire value. (v) The relationship between the Micronaire value and the degree of thickening θ estimated from cross-sectional profiles is variety specific.

A study on alkaline treatment of polyester fabric was undertaken during the period under report and it was found that treatment of polyester fabric with NaOH in water gives maximum weight loss followed by ethylene glycol and glycerine in that order for the same concentration and time of treatment. However, moisture regain of fabrics treated with ethylene glycol is always higher than those treated with the other two reagents.

To synthesise eco-friendly azo dyes, a few non-carcinogenic aromatic amines were identified from literature search. From one such amine Aniline 2,5 disulphonic acid seven different azo dyes were synthesised. The new dyes showed good colourfastness characteristics.

Under a study on isolation, characterisation and application of natural dyes it was found that PH liquor, an effluent from viscose manufacturing industry could dye tannic acid and alum mordanted cotton to a buff colour. Replacing alum with ferrous sulphate yields a brown colour. Dyed samples possess good lightfastness and washfastness property. Boiling of dried marigold flowers with acidulated or plain water yields a dye which can produce yellow colour on tannic acid and alum mordanted cotton with good lightfastness. Pretreatment of manjith root powder with cellulase enzyme resulted in better extraction of dye without the prolonged boiling as indicated by the higher absorbance value.

To optimise the conditions of cellulase enzyme finishing for cotton fabrics under a study on the effect of enzymatic treatments on properties of woven fabrics, treatments were carried out at 3 different concentrations, *viz.* 0.5%, 1.0% and 1.5%. Two types of fabrics, *viz.* medium quality cotton

shirting and coarse quality cotton poplin were used in the experiment. Untreated and treated fabrics were tested for percent weight loss, tensile strength, air permeability and drape. It was observed that cellulase enzyme adversely affected the tensile strength of fabric, but improved its air permeability and drape.

Two industrially important enzymes cellulase and amylase were produced by solid state fermentation by using the organisms *Penicillium funiculosum* and *Bacillus subtilis*159. Wheat bran, a cheap source of carbon and nitrogen, was used for the cultivation of the organisms. Conditions such as substrate-to-liquor ratio, inoculum size and incubation period were standardised. Further work to enhance production of enzyme by supplementing with other nutrients is in progress.

Under a study on the enrichment of cellulosic materials with microbial proteins for improved digestibility, it was found that the digestibility of cottonseed hulls can be improved by subjecting them to anaerobic treatment for seven days at room temperature.

To study the microbial retting of bast fibres meant for textile applications one set of decorticated ramie fibres was degummed by the conventional kiering process and another by the anaerobic treatment standardised at CIRCOT. It was observed that fibres kiered with 4% alkali had 0.6% of residual gum while the anaerobically treated ramie did not show any trace of gum. Anaerobically treated samples were smoother and more lustrous than their chemically treated counterparts. The anaerobically degummed ramie fibres were cut into staples of 35 mm length and were blended with polyester (1.2d x 38 mm) and cotton (MCU.5) both in carded and combed forms. Fibres blended in different proportions were spun by the CIRCOT microspinning technique. It was observed that 33% ramie could be blended with cotton while with polyester the blending can be done up to 50 %.

Extension Activities : During the period under report the Director and Scientists of CIRCOT continued as members of various committees of BIS for cotton and textile testing, and of advisory panels of ATIRA, BTRA, SITRA, BUDCT, etc. Some of the key extension activities of CIRCOT during the period under report were the supply of accurate and reliable data on the quality aspects of cotton fibres, yarns and fabrics, consultancy services and publication of research results for the benefit of appropriate user groups. The Testing House received over 12,300 samples which were tested and reports issued soon after. Training courses on cotton quality evaluation were conducted at the headquarters for 65 sponsored personnel in 11 batches. At GTC, Nagpur, 137 sponsored ginning personnel were trained.

1

Introduction

This seventy-fifth Annual Report of the Central Institute for Research on Cotton Technology (CIRCOT), covers the period April 1, 1998 to March 31,1999.

CIRCOT was established by the Indian Central Cotton Committee (ICCC) in the year 1924 under the name of Technological Laboratory of ICCC. The objectives then were to undertake spinning tests on various cotton strains received from agricultural departments in the country and to test their spinning values. To carry out these activities, the Institute had established co-ordination with the Departments of Agriculture and Agricultural Universities located in major cotton producing tracts in the country. After the abolition of commodity committees including the ICCC, and the administrative control passed on to the Indian Council of Agricultural Research (ICAR) its name was changed to Cotton Technological Research Laboratory (CTRL). Since then the research activities were reoriented and strengthened towards increasing the production and quality of cottons in the country. Research on the better utilisation of cotton and cotton agro-wastes was recently accorded priority in order to make cotton cultivation more remunerative, and to promote self employment opportunities for rural people.

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

Mandate

* To participate in cotton improvement research by evaluating the quality of new strains evolved by agricultural scientists in India and giving them the necessary technological inputs to produce cottons meeting the quality requirements of textile industry.
* To undertake basic and applied research in post harvest technology for improving the quality of cotton fibres and finished products.
* To maintain an update of quality and

performance of different varieties of cotton and by-products as well as of other ligno-cellulosic materials

* To undertake commercial testing of textile materials for the benefit of trade, industry and Government agencies and provide consultancy services.

* To develop new technologies for utilization of cotton, cotton plant, agricultural and industrial processing wastes and strive for commercial exploitation of such technologies.

* To function as a national centre for education and training in cotton technology and related areas.

Past Achievements

➢ Effect of drip irrigation on yield and quality of cotton was assessed at the Regional Unit of CIRCOT at Surat. The study revealed that the variations in seed cotton yield, ginning percentage, seed index, lint index, fibre length, Micronaire value, fibre maturity and strength for different levels of drip irrigation are non-significant. Drip irrigation was found to be beneficial for cotton cultivation only because of 50% saving of water.

➢ CIRCOT has examined the adaptability of the Length and Maturity Module of AFIS (the Advanced Fibre Information System) for cotton quality for Indian cottons by generating data for a large number of samples covering a wide spectrum of length and maturity. From the study it was concluded that fibre length by weight obtained from AFIS can be used to arrive at effective length and short fibre content for Indian cottons quickly and more conveniently than by using conventional array patterns. Also quicker and more reliable estimation of fibre maturity is possible by AFIS than that given by the conventional caustic soda swelling method.

➢ CIRCOT has designed and proposed a scale useful for measuring the staple length of cotton either in inch or mm. The scale is very handy and is popular among cotton traders. CIRCOT trainees are offered this scale at a nominal cost.

➢ Naturally coloured cottons including hybrids grown under different agro-climatic conditions have been evaluated at CIRCOT for their technological properties including colour fastness to washing with detergent. In the case of parental strains as well as hybrids, detergent improves the colour intensity considerably during the first cycle of wash. Repeated washes tend to reduce the colour. Even after ten

wash cycles the colour was found to be still better than that of the unwashed material.

- Dyeing techniques have been developed at CIRCOT to dye viscose/cotton blended fabrics with natural Indigo. Indigo is a vat dye, insoluble in water which, in its reduced form is yellow in colour while in the oxidised form it is blue. The viscose/cotton blend was dyed to 5% shade at room temperature using a multi-dip process. The material developed a greenish blue colour and it possessed good fastness properties. Various shades of green were obtained when the Indigo dyed fabric was re-dyed with Berberine. Post mordanting of the Indigo dyed fabric with iron gave a greenish black shade.

- Four isolates of Gram-negative bacteria, *viz.*, *Beijerinckia indica*, *Enterobacter agglomerans*, *Klebsiella oxytoca* and *Xanthomonas* sp. have been recovered from developing healthy cotton bolls. The occurrence of these bacteria on the pollen grains has been attributed to contamination of the developing ovule and lint during boll development. The population has been found to be maximum in the early stages with a significant reduction on dehydration. Exclusively Gram-negative bacteria were recovered from all varieties in their never-dried state from all the species of cotton. The significance of these bacteria lies in the fact that the mill-fever syndrome **'Byssinosis'** is attributable to them.

- CIRCOT has standardized a method for degumming ramie fibres under anaerobic conditions at room temperature. The method involves the use of a mixed microbial consortium and there is no loss in strength after degumming. The method is inexpensive and eco-friendly. The solution after anaerobic treatment containing gum and other organic matter can be utilised for the production of biogas. The effluents generated will not be toxic. The process has potential for commercial exploitation.

- A two-step process for making pulp from crop residues has been standardised at CIRCOT. Anaerobic digestion followed by mild alkali treatment has been effective for pulping cotton stalk and rice straw. The new process referred to as biopulping has been patented. Saving on chemicals and energy as well as the low polluting nature of effluents are the merits of this new process.

- Cyclone dust like willow dust, is a cellulosic waste material abundantly available in textile mills. CIRCOT has standardised a method to produce biogas from cyclone dust by

a semi-continuous fermentation process. A biogas unit just designed in a textile mill in Mumbai will be using this semi-continuos fementation technology.

- A biogas plant to process 50 tonnes of cyclone dust using CIRCOT technology has been commissioned in M/s. Century Yarn, Satrati, M.P. The installation cost of the plant was Rs. 1.75 lakhs. It is expected that this cost would be recovered in less than three years through optimal gas production. The plant is generating about 30 m^3 of biogas every day.

- Honey-dew is a sugary and sticky substance produced by insects (aphids) that gain entry into seed cotton during picking. Honey-dew causes processing problems during ginning and spinning. To obviate this problem, CIRCOT suggests spraying of a composite microbial culture which has no adverse effect on the cotton, is very easy to apply, and ensures 100% guarantee for effectiveness besides being highly economical.

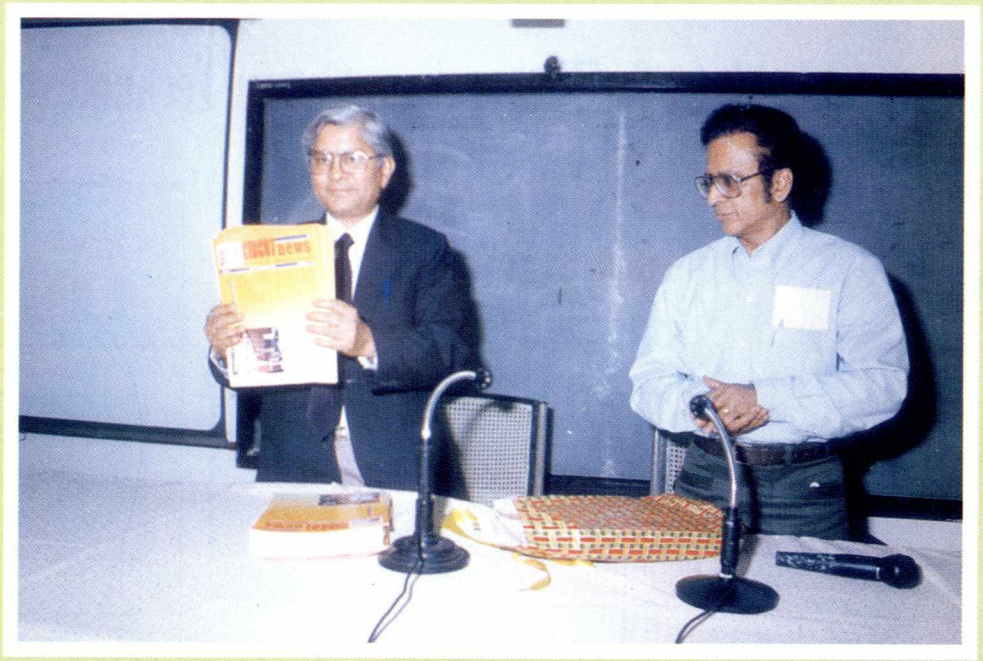
- For ginning small cotton samples such as those for estimation of ginning percentage or for producing seeds for sowing, CIRCOT designed portable ginning machines for use by ginners, breeders, seed industry, farmers and traders. Licence has been issued for fabrication and supply of CLOY Gin and *Kisan* Gin to an engineering company in Nagpur.

- A similiar collaboration in respect of pneumatic conveying systems has also been established with AVI Ginning Machinery, Ahmedabad. Besides certifying the machines made by this Company for transporting cotton in ginning factories, CIRCOT will also offer suggestions for improvement of machinery design and efficiency.

- One of the principal mandates of CIRCOT is to serve the ginning industry in India. The Ginning Training Centre of CIRCOT at Nagpur established in 1984 has facilities for training gin fitters, supervisors and managers. Hundreds of professionals from cotton trade and industry have received training at GTC.

- In order to strengthen the interaction with ginning industry, CIRCOT has launched a Technical Consultancy Scheme under which the Institute will offer a package of benefits against payment of an annual consultancy fee. The scheme was formally launched at Dhrangadhra in Gujarat in September 1998. Under the Technical Consultancy Scheme, CIRCOT will offer the following services to the ginning units :

INAUGURATION OF NEWSLETTER

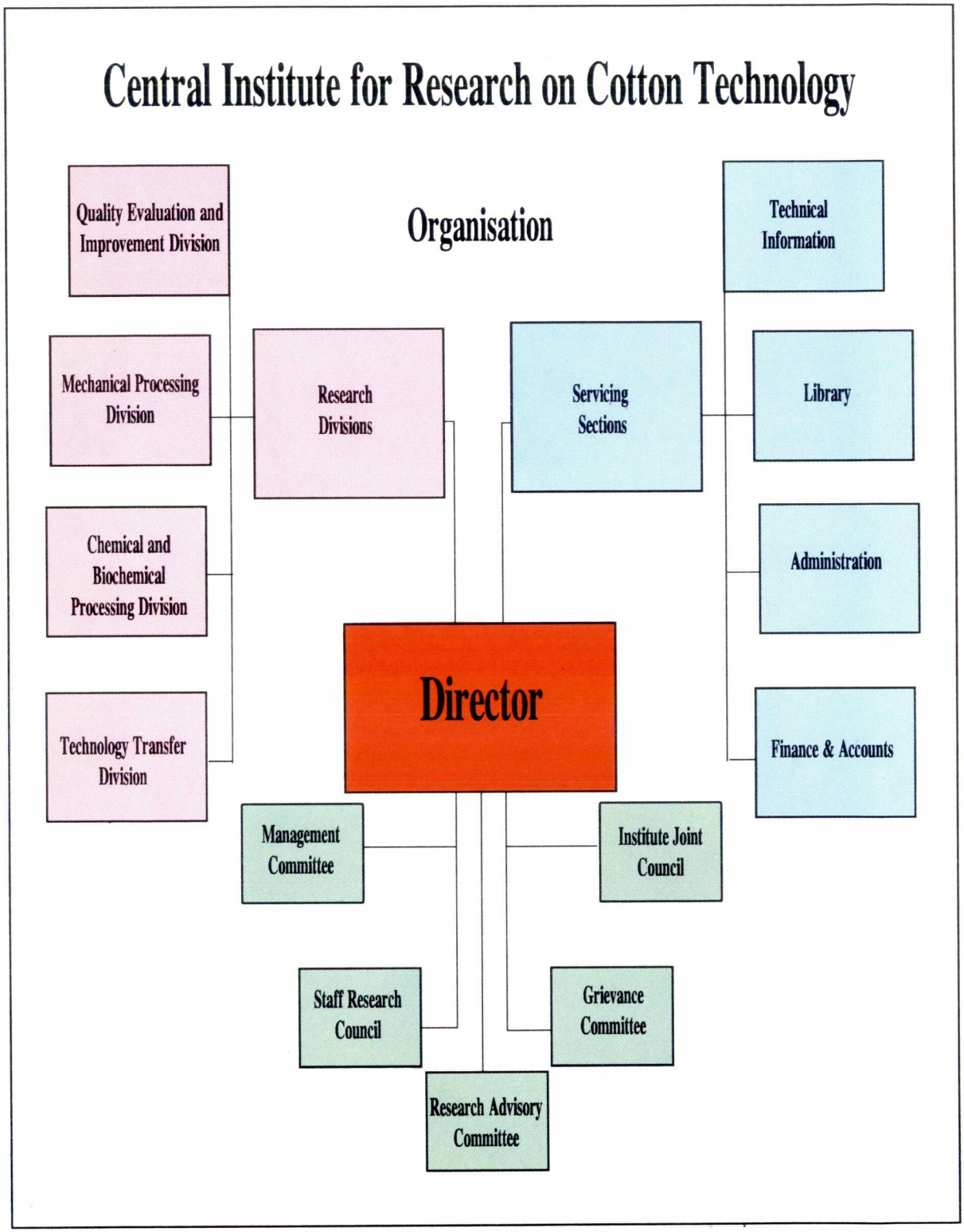


Inauguration of CIRCOT News *by Dr. Anwar Alam, DDG(Engg.), ICAR*

A Section of the Audience

Central Institute for Research on Cotton Technology

Organisation



* Technical advice on matters relating to productivity and efficiency of the unit.

* Training of personnel in gin operation and maintenance.

* Advice on modernisation.

* Supply of information on ginning of cotton in India.

The distinguishing feature of the training component in CIRCOT package is that the institute will conduct such programmes in towns where many ginneries are located rather than at the GTC, Nagpur. This means that CIRCOT will now go to the ginner instead of calling him to Nagpur for training. Several ginneries have enrolled themselves for the CIRCOT package. The first training programme under the new scheme was organised at Dhrangadhra from November 9 to 14, 1998. Future programmes will be announced in due course.

Organisation

As could be seen from the organisational chart, Director heads the Institute assisted by 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.

Financial Statement

Expenditure and Receipts of the Institute during 1998-99

A. Expenditure

(Rs. in lakhs)

Sl. No.	Head of Account	Expenditure	
		Non-Plan	Plan
1.	Establishment Charges OTA	382.40 0.21	0.24
2.	Traveling Expenses	5.00	0.99
3.	Other Charges i) Office Contingencies ii) Works	 50.00 12.00	 155.44 43.75
	Total	449.61	200.42

B. Receipts

Sl. No.	Head of Account	Amount
1.	Analytical and Testing Fees	22.26
2.	Training	03.29
3.	Interest on TDR & STD	01.21
4.	Other receipts	11.14
	Total	37.90

Staff Position

As on March 31, 1999

Cadre	Sanctioned	In Position
Scientific	50	36
Technical	138	124
Administrative	53	53
Supporting + Canteen Staff	82 + 1	72 +1
Total	**324**	**286**

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Research Achievements

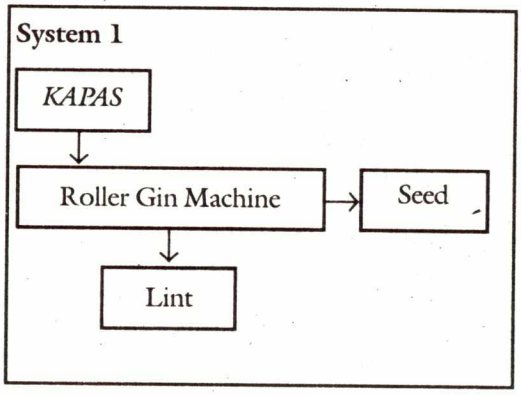
A brief account of the progress of research work during 1998-99 at CIRCOT and its regional units including the Ginning Training Centre at Nagpur, is given below :

CORE AREA I: IMPROVEMENT OF GINNING OF COTTON **(including Mechanical Processing)**

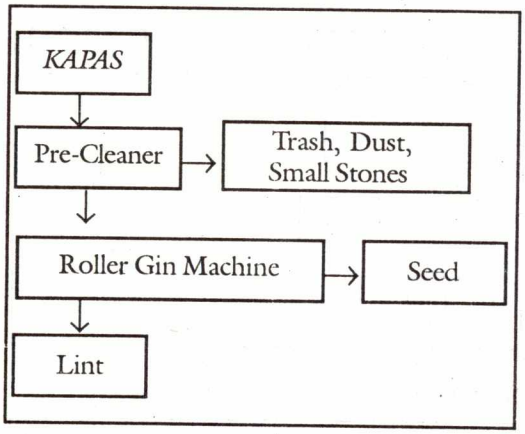
Effect of Precleaning, Ginning and Post-Cleaning on Lint and Yarn Quality of Different Varieties of Cotton

During the reporting period, NHH.44 and LRA.5166 cultivars were selected in adequate quantities for conducting commercial trials. Processing of seed cotton was also completed as per the sequence given below :

System 1



System 2



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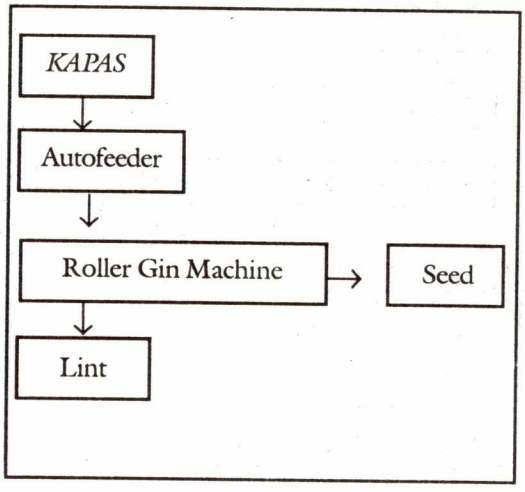

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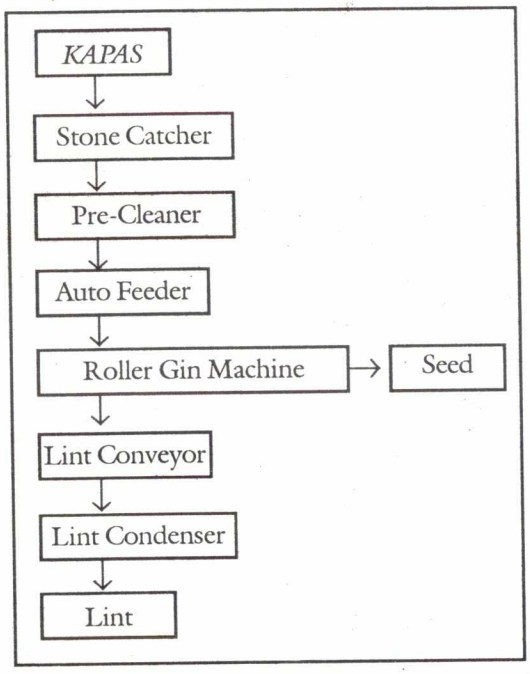
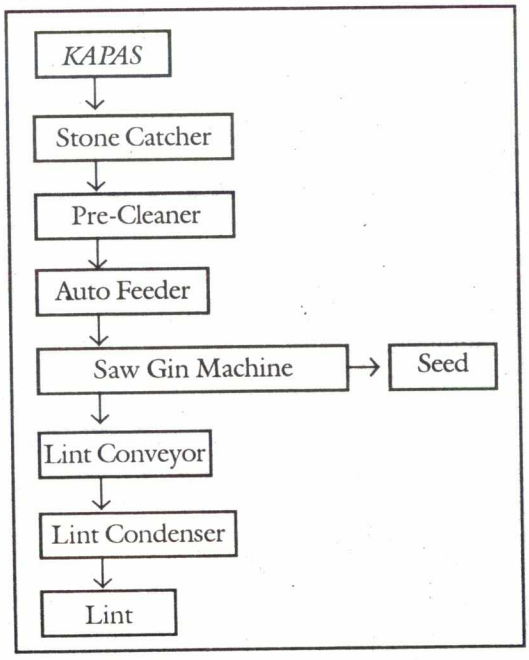


System 5



Saw Ginning Trials :

Trials were conducted at the Saw Ginning and Pressing factory Maharashtra State Co.Op. Cotton Growers' Marketing Federation Ltd., Babulgaon, Yeotmal Dist., in Maharashtra. The plant is fully automatic and the machinery is imported from Murray USA. NHH.44 FAQ and NHH.44 FAIR cultivars were used for commercial trials. Trials were conducted in duplicate and lint samples were collected for testing fibre properties and spinning trials.

Double Roller Ginning :

Roller ginning experiments were conducted on NHH.44 and LRA 5166 as per the sequence given above and the lint samples were collected for tests in fibre quality and for spinning trials.

CORE AREA II : EVALUATION AND IMPROVEMENT OF QUALITY 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

TABLE 1(a) : NUMBER OF COTTON SAMPLES RECEIVED AT THE CIRCOT HEADQUARTERS FROM AGRICULTURAL TRIALS DURING 1998-99

Type of test	Average for the quinquennium 1990-91 to 1994-95	1995-96	1996-97	1997-98	1998-99
Fibre and Full Spinning	206	102	82	–	40
Fibre and Microspinning	1694	1182	1868	–	720
Microspinning alone	–	–	–	1266	–
Fibre test alone	531	365	574	2701	921
Mill test	9	–	–	–	–
Standard Cottons	18	19	25	10	17
Trade Varieties					
– Lint	21	14	–	31	9
– Kapas	27	–	9	–	–
Technological research	68	–	1	342	–
Miscellaneous	9	–	2	39	–
Total	2583	1682	2561	4389	1707

TABLE 1 (b) : NUMBER OF COTTON SAMPLES TESTED AT THE REGIONAL QUALITY EVALUATION UNITS DURING 1998-99

Regional Quality Evaluation Unit of CIRCOT	Quality Parameters				
	Fibre length	Fibre fineness	Fibre strength	Fibre maturity	Micro-spinning
Akola	1458	581	362	581	–
Coimbatore	1868	1113	1110	1058	92
Dharwad	399	400	400	328	–
Guntur	859	859	676	859	–
Hisar	1880	795	644	644	–
Indore	626	626	635	626	–
Ludhiana	2170	1374	1374	1322	–
Nagpur	1155	1104	1137	950	–
Nanded	671	671	671	671	–
Rahuri	823	749	767	749	–
Sirsa	362	362	362	280	–
Sriganganagar	2224	2224	1553	1732	–
Surat	9055	5790	7010	5790	11

TABLE 2 : NUMBER OF COTTON SAMPLES TESTED AT CIRCOT UNDER AICCIP DURING 1998-99

State	Fibre and full spinning	Fibre and Micro spinning	Fibre tests alone	Total
Punjab	17 (3)	88 (11)	67 (9)	172 (23)
Haryana	–	101 (12)	99 (9)	200 (21)
Rajasthan	5 (1)	48 (7)	75 (7)	128 (15)
New Delhi	–	18 (1)	252 (2)	270 (3)
Uttar Pradesh	–	18 (3)	18 (3)	36 (6)
Gujarat	14 (2)	–	97 (7)	111 (9)
Maharashtra	–	140 (18)	22 (4)	162 (22)
Madhya Pradesh	–	152 (9)	44 (2)	196 (11)
Karnataka	4 (1)	117 (14)	60 (7)	181 (22)
Andhra Pradesh	–	5 (1)	–	5 (1)
Tamil Nadu	–	33 (7)	187 (4)	220 (11)
Total	40 (7)	720 (83)	921 (54)	1681 (144)

Note : The numbers in brackets relate to reports issued.

aspects relevant to cotton improvement work.

(a) Evaluation of the quality of cotton samples received from agricultural trials and the All India Co-ordinated Cotton Improvement Project (AICCIP)

A large number of cotton samples are being received every year for technological evaluation from trials conducted by the AICCIP, through Agricultural Universities and State Agricultural Departments. The number of samples received during 1997-98 for different tests from agricultural trials at the Headquarters has been given in Table 1 (a). The number of samples tested at each of the Regional Quality Evaluation Units of CIRCOT is presented in Table 1(b). Table 2 gives the number of cotton samples received and tested at CIRCOT for various quality parameters from different states.

The samples received were tested in the order of their receipt and test reports on them were sent soon after the tests were over. The test results on Trade Varieties and Standard Indian Cotton samples are reported in the form of periodical Technological circulars and at the end of the year, these are compiled for the whole season and published as Technological Reports for Trade Varieties and Standard Varieties of Indian cottons.

All India Co-ordinated Cotton Improvement Project (AICCIP)

The ICAR launched the AICCIP, in April 1967 with a view to achieving closer collaboration between the scientists of various disciplines as well as bringing together Agricultural Universities, Central Institutes and State Departments of Agriculture for cotton improvement research. The main objective of this Project has been to look into the problems of production, productivity and quality of cotton with a multi-disciplinary approach. CIRCOT's contribution in this project is the testing of all the samples generated in various trials for fibre quality and spinning potential. Tests are conducted at the headquarters in Mumbai as well as in the 13 regional units spread throughout the country.

The breeding materials available with the cotton breeders of various states are systematically screened every year and only the promising materials are considered for further trials. Maintenance of Germplasm as well as Initial Evaluation Trials (IET) and Preliminary Varietal Trials (PVT) form the preliminary stages of screening while Co-ordinated Varietal Trial (CVT), Full Spinning Trial and Mill trial constitute the advanced trials under this project. Yield would be the main criterion in the Initial Evaluation Trial while both yield and quality are considered as criteria for further selections. This is the 32st year of the AICCIP.

Owing to different agro-climatic conditions, cotton growing and harvesting seasons differ widely from state to state, and therefore breeding trials are conducted zone-wise. Thus, three zones are identified according to agro-climatic conditions. The North Zone comprises the states of Punjab, Haryana, Rajasthan, Uttar Pradesh and New Delhi, the Central Zone includes the States of Madhya Pradesh, Maharashtra and Gujarat, and South Zone covers the states of Andhra Pradesh, Karnataka and Tamil Nadu.

As many as 1707 cotton samples were screened for fibre properties and spinning potential during 1998-99 season. The test data on various breeding trials were presented at the Panel Meetings held at Coimbatore during 1998. The work done under various breeding trials is summarised below zone-wise:

North Zone

This zone is mainly known for its medium staple American *G. hirsutum* and short staple *G. arboreum* types of cottons. The main object of the trials is to identify strains superior to the existing varieties. Emphasis is also given to evolve strains of early maturing or short duration type with a view to making the field available for the second crop of food grains.

G.hirsutum Trials :

The Co-ordinated Varietal Trial (CVT) Br.04 for Normal Plant Type as

well as early maturing Compact Type were conducted at Banswara, Bhatinda, Faridkot, Hisar, Ludhiana, Mathura, Sirsa and Sriganganagar. Table 3 shows the ranges of 2.5% span length, Micronaire value and bundle tenacity at 3.2 mm gauge lengths along with spinning potential. The strains that had recorded encouraging spinning performance at different counts and at different locations are listed below as promising strains :

Location	*Count*	*Promising Strains*
Bhatinda	16s	RS-992 (N.T.)
	20s	F.1255, F.1424, F.1638, F.1537 (N.T.)
	30s	LH-1919, Pusa-180, Pusa-180, Pusa-3142, LH-1556 (C.T.)
Faridkot	16s	F.1695, F.1791 (C.T)
	20s	F.1557, F.1638, F.1537 (N.T.), F.1408, Pusa-189 (C.T.)
Hisar	20s	F.1695, RS.2060, RS-2013, F.1791, F.1408 (C.T.)
	30s	LH.1769, F.1537 (N.T.)
Ludhiana	20s	H.1123, LH.1769, F. 1638, F.1537 (N.T.),
	30s	F.1537 (N.T.), LH.1919, LH.1832, Pusa-19-17, Pusa-180, Pusa-3142 (C.T.).
Mathura	30s	F.1537 (N.T.), LH.1832, RS-2013, Pusa-3142 (C.T.)
Sirsa	40s	LH-1919, Pusa-3142, Pusa-19-17, Pusa 453-6 (C.T.)
Sriganganagar	20s	F.1557, F.1638 (N.T.), H.1220, F.1791 (C.T.)

Note : N.T - *Normal Type ;* C.T. -*Compact Type & Short Duration*

Samples pertaining to Initial Evaluation Trial (IET), Br.02 received from Abohar, Banswara and Hisar was tested for physical properties of fibre. The 2.5% Span length ranges from 23.5 mm to 26.4 mm,(all medium) Micronaire value from 3.5 to 4.8, (fine to average) maturity from (average to good) and bundle tenacity at 3.2 mm gauge length from 20.5 g/t to 23.3 g/t (all average). The samples seem to be good for spinning 30s count.

The samples whose FQI was more or equal to control are given below, location-wise.

Location	*Strains (FQI better than or equal to control)*
Abhor	LH.1903, Pusa.101. Pusa.325, F.1607, RS.2046

G.arboreum Trial :

The Co-ordinated Varietal Trial (CVT) Br.24 was conducted at Hisar, Ludhiana, Mathura and Sriganganagar. The object of this trial was to identify coarse short staple and high ginning out-turn varieties in the place of existing varieties. The promising strains with Micronaire value 7.0 and above are listed below, location-wise :

Location	*Promising Strains*
Hisar	RG.83, RG.24, HD.328
Ludhiana	RG.83, LD.717, LD.694, LD.702, LD.716, RG.53
Mathura	RG.83
Sriganganagar	RG.24, RG.133, HD.328, LD.717, LD.627, LD.702, LD.716, RG.53

Hybrid Trials :

The objective of this trial has been to identify and cross breed the superior varieties in comparison to the existing varieties. The superiority is generally considered against the yield and technological properties. The samples belonging to *intra-hirsutum* hybrid trial involving *G. hirsutum* x *G. hirsutum* crosses were received from Banswara, Faridkot, Hisar, Ludhiana, Sriganganagar under irrigated conditions (Br.05(a)-I) and from Ludhiana and Sriganganagar under rainfed conditions (Br.05(b)-I). The promising strains are listed below, location-wise and count-wise.

TABLE : 3 SUMMARY OF TEST RESULTS ON COTTON STRAINS UNDER CO-ORDINATED VARIETAL TRIALS (BR.04) IN NORTH ZONE

Location	No. of Samples	Range of				Spinnning Performance			Control Variety
		2.5% Span Length (mm)	Micronaire Value	Maturity fibre (%)	Bundle Tenacity (g/t) 3.2 mm gauge	Count	A	B	
1	2	3	4	5	6	7	8	9	10
Normal Plant Type									
Banswara	5FT	26.1 - 29.6	3.8 - 4.5	–	20.2 - 23.2	–	–	–	–
Bhatinda	7F	21.3 - 26.6	4.6 - 5.4	69 - 80	16.8 - 20.5	16s 20s 30s	1 4 1	– – –	– – F.846
Faridkot	6M	23.5 - 25.3	4.7 - 5.0	75 - 81	16.5 - 20.0	16s 20s	1 3	– 5	– F.1378
Hisar	6M	22.5 - 26.8	4.4 - 4.9	71 - 83	20.0 - 22.0	30s	3	–	–
Ludhiana	5F	22.9 - 26.0	4.8 - 5.3	74 - 85	18.1 - 22.7	16s 20s 30s	1 5 1	– – –	– – –
Mathura	6M	24.6 - 29.7	4.3 - 4.8	66 - 80	19.5 - 24.3	30s	2	3	Vikas
Sriganganagar	6M	21.9 - 25.4	4.6 - 5.4	73 - 85	18.5 - 21.4	20s	2	2	RST-9

Table 3 (Contd)

1	2	3	4	5	6	7	8	9	10
Compact Plant Type BrO4 (b)									
Bhatinda	6M	22.4 - 26.3	4.6 - 5.1	70 - 82	18.2 - 22.2	30s	2	–	LH-1556
Faridkot	6F	23.9 - 26.5	4.0 - 5.0	69 - 80	15.9 - 21.7	16s 20s 30s 40s	2 2 – –	– – – –	– F.1054 F.1054
Hisar	6M	22.8 - 25.9	3.9 - 4.7	61 - 80	18.0 - 19.8	20s	5	4	HS.6
Ludhiana	8M	24.1 - 27.8	4.1 - 4.7	62 - 85	19.4 - 25.4	30s	7	1 1	F.1054 LH-1556
Mathura	6M	25.0 - 30.3	4.4 - 4.1	66 - 84	19.8 - 23.2	30s	3	4	Vikas
Sirsa	6M	23.5 - 26.2	4.0 - 4.6	62 - 70	16.1 - 21.9	40s	4	4	HS.6
Sriganganagar	7M	22.5 - 25.7	4.3 - 5.1	68 - 87	18.0 - 20.2	20s	3	3	RST.9

F - Full Spinning M *- Microspinning* A *- No. of samples spinnable to selected count*

B *- No. of samples having spinning performance better than or on par with control FT - Fibre Test alone*

Location	*Count*	*Promising Strains*
		Irrigated Br.05(a)-I
Faridkot	40s	LHH-107, LHH 10x43
Hisar	30s	LHH-107, HHH-217, HHH-221, FHH-68
Ludhiana	40s	LHH-107, LHH-1028, LHH 10x43, RajHH-23
Sriganganagar	30s	RajHH-469
		Rainfed Br.05(b) I
Hisar	30s	HHH-81, VICH-9, NFHH-920, Bio-6669
Ludhiana	40s	VICH11, Bio-6669, Avani Laxmi
Sriganganagar	30s	HHH-81, GK-151 ACH-09, Avani Uriya

The samples under inter-*hirsutum* hybrid trial, male sterile base (Br.05(a)II), were received from Faridkot, Hisar, Ludhiana, and Sriganganagar. The promising strains at different locations are given below, countwise.

Location	*Count*	*Promising Strains*
Faridkot	40s	CSHH-84
Hisar	30s	CSHH-84, HHH-220
Ludhiana	40s	LHH-731, Mahesh-1
Sriganganagar	30s	LHH-731, RajHH-16, CSHH-85, FHH-83

Desi Hybrid Trials :

Lint samples from *desi* hybrid trial (Br.25) were received from Hisar, Ludhiana and Sriganganagar. The samples whose Micronaire value is 7.0 and above are enlisted below as promising strains.

Location	*Promising Strains*
Hisar	AAH-1, RajDH-6, LMDH-3, RajDH-7
Ludhiana	_
Sriganganagar	AAH-1, AAH-4, AAH-242, RajDH-6, LMDH-1, LMDH-3, LMDH-2, RajDH-7, RajDH-3, AAH-5, AAH-3

Central Zone :

This zone has the largest area under cotton cultivation. Although the main thrust is to improve the existing American type (*G.hirsutum*) cottons, quite a number of cottons from *G.arboreum* species are also cultivated. For many years hybrids such as H-4, H-6, H-8, JKHy-1, etc. were being cultivated in this zone. Attempts are now being made to evolve early maturing hybrids without losing yield and quality. As there is increase in demand for medium and superior medium categories of cottons, concerted efforts are also on to evolve *desi* hybrids. Trials are also on for the improvement of cottons from *G.herbaceum* species traditionally grown in some pockets of Gujarat state.

G.hirsutm Trial :

Co-ordinated Varietal trial, Br.04 was conducted at, Akola, Rahuri under irrigated conditions and from Badnawar, Indore and Khandwa under rainfed conditions. The ranges of 2.5% span length, Micronaire value, maturity and bundle strength along with their spinning assessment have been given in Table 4.

The promising strains having good spinning potential along with locations and the selected counts are as follows :

Location	*Count*	*Promising Strains*
		Irrigated
Rahuri	40s	GSHV-1500, GISV 86/58, CNH-1007, GJHV-47
		Rainfed
Badnawar	30s	JLH-1594, NH-529, JLH-1494, KH-109, G-3987, NH-514, KH-107, AKH-8828, KH-101, JLH-1492, KH-103, CJHS-52

Location	*Count*	*Promising Strains*
Indore	40s	GJHS-52, KH-103, JLH-1492, AKH-8828, KH-107, NH-514, KH-109, JLH-1494, NH-529, JKH-1594.
Khandwa	50s	GJHS-52, KH-103, JLH-1492, KH-101, AKH-8828, KH-107, NH-514, KH-109, JLH-1494, NH-529, JLH-1594.

G.arboreum Trial :

The Co-ordinated Varietal Trial Br.24 was conducted at Akola and Khandwa. The object of this trial was to identify coarse staple and high ginning out-turn varieties. The samples are spinnable to coarse counts, *viz.* 10s, 16s & 20s. In the case of Akola, the strains whose FQI is more than that of the control are listed below together with the promising strains from Khandwa.

Location		*Strains (FQI better or equal than control)*
Akola		AKA-8702, GAM-48

Location	*Count*	*Promising Strains*
Khandwa	20s	PA-314, KWA-20, KWA-19, KWA-17, AKA-8617, AKA-9118, AKA-8702, CINA-306, JLA-0794, PA-363, PA-375, PA-376, NA-428, PA-241, JLA-1693, PA-304, PA-262, PA-255, PA-296, GAM-52, GAM-48

Hybrid Trials :

The objective of this trial was to identify early maturing hybrids superior in yield and quality and compare them with the existing local hybrids such as H-6, JKHy-1, etc. in Madhya Pradesh, Maharashtra and Gujarat. Importance is also given to evolve *desi* hybrids in view of the demand for medium and superior medium staple categories.

Intra-hirsutum Hybrid Trials of Conventional Hybrids (Br.05 I) :

Two sets of samples *viz.* Br.05(a) I from Ahmedabad, Rahuri, Surat under irrigated condition and Br.05 (b) I from

TABLE 4 : SUMMARY OF THE TEST RESULTS ON COTTON STRAINS UNDER CO-ORDINATED VARIETAL TRIALS OF BR.04 IN CENTRAL ZONE

Location	No. of samples	Range of				Spinning Performance			
		2.5% span length (mm)	Micronaire value	Mature fibre%	Bundle tenacity(g/t) 3.2mm gauge	Count	A	B	Control variety
Irrigated									
Akola	6FT	25.9-28.4	3.3-3.8	69-83	18.0-21.2	-	-	-	-
Rahuri	5M	26.5-29.4	4.1-4.5	63-80	20.8-22.0	40s	4	4	L.C.
Rainfed									
Badnawar	13M	24.2-33.2	2.8-4.0	54-79	17.4-23.2	30s	12	12	L.C.
Indore	14M	24.8-29.9	3.4-4.5	65-85	18.3-23.3	40s	12	12	Vikram
Khandwa	14M	24.2-27.7	2.9-3.6	45-70	17.1-22.9	50s	12	3	LRA.5166 L.C

A - No. of samples spinnable to the count selected
B - No. of samples better than or on par with control

M - *Microspinning*
FT - *Fibre Test alone*

Akola, Khandwa, Nanded under rainfed condition were received and were evaluated for physical properties of fibre and spinnability. The promising strains are listed below both location-wise and count-wise:

Location	*Count*	*Promising Strains*
		Irrigated
Ahmedabad	50s	MBCRH-2, PRC-31, SANDOCOT-5, SANDOCOT-32, NAUKAR-9, ALCH-207, BARCH- 60, NIMBKAR, EPCH-2, SAGAR-1882
	60s	SNSCH-46, VICH-9, CHALMI 7, NBHH-639, VICH-5, VCHH-567
Rahuri	40s	CZHH-509, CZHH-511, CZHH-502, CZHH-518, CZHH-523
		Rainfed
Khandwa	50s	CNPHH-101, NHH-311, ACH-100, KDCHH-144, NBHH-1968, DCHH-569, AH-133, RHH-0492, RAHH-133 DHH-11, NSPHH-1, GHH-1498, G(B)HH-13, PHH-231, PHH-316, KH-11, KHH-110
Nanded	30s	G(B)HH-13, PHH-316, RHH-1594, RHH-0492

Intra hirsutum Hybrid Trials of Male Sterile base (Br.05 II) :

Samples were received from Ahmedabad, Badnawar and Rahuri under irrigated conditions and from Akola, Aurangabad, Nanded under rainfed conditions. The promising strains in both irrigated and rainfed conditions are as follows, count-wise.

Location	*Count*	*Promising Strains*
		Irrigated
Ahmedabad	60s	NFHH-6120 (Rep. I & III), VCHH-101(Rep. II & III), VICH-II (Rep. III), NFHH-19506 (Rep I, II & III), MECH-302 (Rep. II), KDMH-14 (Rep.I, II & III)

Location	*Count*	*Promising Strains*
Badnawar	50s	Sweta, WHH-55, AH-131, KDCMH-II, GGMSH-1, NFHH-1110, CINH-112, CINHH-13, NCHH-64, CAHH-7, CAHH-85, CINHH-109
Rahuri	40s	NCHH-64, CINHH-113, VICH-9
		Rainfed
Akola	_	_
Aurangabad	40s	VICH-11 (Rep. I, II, III & IV), NIMBKAR (Rep. I, II, III & IV), VICH (Rep I, II, III & IV), MECH-303 (Rep. I, II, III & IV), KDCMH-22 (Rep.I, II & III & IV) 23, RAC-104 (Rep. II, III & IV), NFHH-95-464 (Rep. I, III & IV), ACHH-210 (Rep. I, II, III & IV)
Nanded	_	AH-101, NCHH-54, WHH-651(G), CAHH-98, MBCH-666

Desi Hybrid Trials (Br.25) : Of the samples received from Akola and Indore samples received from Indore only are promising and are listed below:

Location	*Count*	*Promising Strains*
Indore	40s	Sandocot, MBDCH-545, MDCH-223, GSGDH-2, AKDH-7, AKDH-3, AKDH 8, MDCH-222

Interspecific Hybrid Trial (Br.15) : From only two locations, the samples were received and the upright and promising strains are listed out as follows:

Location	*Count*	*Promising Strains*
Padegaon	80s	CZHB-1507, CZHB-1508, CZHB-1512, CZHB-1515, CZHB-1516, CZHB-1517, CZHB-1523
Rahuri	60s	CZHB-1505, CZHB-1509, CZHB-1511, CZHB-1515, CZHB-1516

South Zone :

This zone comprises the states of Andhra Pradesh, Karnataka and Tamil Nadu and is popular for cultivation of long and superior long staple cottons. Although *G.hirsutum* cottons cover the largest area, the other three species are also grown in this zone. Both *intra-hirsutum* and *inter-specific* hybrids are also cultivated on a big scale in this zone. The cultivation is being done both in irrigated and rainfed conditions.

G.hirsutum Trials :

Co-ordinated Varietal trials Br.04 were conducted at Arabhavi, Siruguppa under irrigated conditions and at Dharwad under rainfed conditions. The ranges and the average values of 2.5% span length, Micronaire value, bundle tenacity and maturity alongwith assessment of spinning potential are given in Table 5. The following samples are upright and have shown encouraging spinning performance.

Location	*Count*	*Promising Strains*
		Irrigated
Arabhavi	40s	SCS-27, CNH-120 MB, ARB-8824
Siruguppa	40s	SCS-27, ARB-184, VRS-19
		Rainfed
Dharwad	40s	CWROK-165, TKH-789, CBR-2, RAH-7, MSKD-26, LDLH-1588, CPD-431, L-601, ICMF-31, CBR-1, SAHANA, CPD-429

Preliminary Varietal Trial :

Trials were conducted at Arabhavi and Siruguppa under irrigated conditions and at Dharwad under rainfed conditions. The samples are likely to be spinnabe around 40s count. The strains whose FQI is equal to or more than control are also listed below:

Location	*Strains*
	Irrigated
Arabhavi	ICMF - 83
	Rainfed
Dharwad	ICMF - 69, NDLH-1678

TABLE 5 : SUMMARY OF THE TEST RESULTS ON COTTON STRAINS UNDER CO-ORDINATED VARIETAL TRIALS OF BR.04 IN SOUTH ZONE

Location	No. of samples	2.5% span length (mm)	Range of			Spinning Performance			
			Micronaire value	Mature fibre%	Bundle tenacity(g/t) 3.2mm gauge	Count	A	B	Control variety
Br.04 (a)									
Arabhavi	7M	24.0-31.3 (27.1)	2.7-3.4 (3.0)	_	16.7-22.2 (19.7)	40s	4	5	ACP-71 (L.C.)
Siruguppa	7M	26.8-31.1 (28.3)	3.1-4.3 (3.6)	64.81 (75)	18.9-22.5 (20.6)	40s	4	5	LRA-5166 MCU-5, VT
Br.04(b)									
Dharwad	16M	25.6-29.7 (27.3)	3.5-4.6 (4.0)	_	18.8-22.5 (21.0)	40s	11	6	L.C SAHANA CPD-429

M - Microspinning
A - No. of samples spinnable to the count selected
B - No. of samples better than or on par with control
Note : The values in the brackets are averages.

Initial Evaluation Trial :

Trials were conducted at Arabhavi, Siruguppa under irrigated conditions and at Dharwad under rainfed conditions. On analysis of the fibre properties it can be said that the samples are likely to be spinnable in the range of 20s to 30s count. On the basis of FQI strains whose FQI are better or equal to control are listed below :

Location	*Promising Strains*
Arabhavi	RAC - 1049, ARB - 9702, TCH - 1569, CCH- 11

Co-ordinated Varietal Trial of *G. arboreum* Br.24(b) was conducted at Dharwad Station alone and analysed for fibre properties and spinning potential. The following samples have emerged out as promising strains at 20s count.

Location	*Count*	*Promising Strains*
Dharwad	20s	JLA-0794, PA-376, NA-428, PA-241

Hybrid Trials :

The objective of Hybrid trials is to evolve hybrids superior to those, which have shown encouraging spinning performance. Existing Hybrid Varieties were in both *intra-hirsutum* and *inter-specific* hybrids. Intra-*hirsutum* Hybrid Trial, Conventional type were conducted at Arabhavi, Attur, Bangalore and Siruguppa under irrigated conditions and at Bangalore, Dharwad, Guntur under rainfed conditions. The samples were subjected to estimation for both physical parameters of fibre as well as spinning. The following samples were promising.

Location	*Count*	*Promising Strains*
		Irrigated
Arabhavi	40s	DHH-542, DHH-543, LAHH-11, ARCHH-32, VCHH-32
Attur	40s	VARCH-87, SNSCH-96, ACHH-475, NBHH-1968, ACHH-427, ACHH-429, MECH-12
Bangalore	–	–
Siruguppa	40s	RACH-2, ARBHH-5, VARCH-67, CCHH-5569, TCHH-2423

Location	*Count*	*Promising Strains*
		Rainfed
Dharwad	40s	AH-133, DHH-543, NDLHH-240, BCHH-568, DHH-542, DHH-509, ARCHH-651, AH-101, ARCHH-1858,CAHH-99, SANDOCOT-26, CAHH-98, 7703, 7709, 7711, 7713, 7716
Guntur	40s	SNSCH-61, SANDOCOT-32, PRC-31, VARCH-60

Six samples set of *desi* hybrid trial was conducted at Dharwad and the samples to estimation were subjected for both physical parameters of fibre as well as spinning. The following sample has come out as promising.

Location	*Count*	*Promising Strains*
Dharwad	20s	AKDH-3

Nine samples set of Inter-specific Hybrid trial, Br.15(a) was conducted at Siruguppa and both tests of physical estimation of fibre and spinning were carried out. The successful promising strains are listed below :

Location	*Count*	*Promising Strains*
Siruguppa	80s	Pusa-HB-15, NFHB-1010, DHB-290, RAHB-51, CCHB-2, NFHB-101, DHB-435

(b) Tests on Standard and Trade Varieties of Indian cottons

(i) Standard Indian Cottons : To assess seasonal fluctuations in the characteristics of Indian cottons and to gauge the comparative superiority of the newly evolved strains, a number of established varieties called Standard cottons are tested every year. These varieties are grown in government farms and cotton research stations under identical conditions. Extensive fibre and spinning tests are regularly being done on such samples and the test results are published for information of cotton breeders and other research workers as early in the season as possible. During 1997-98, 12 cotton varieties have been tested.

(ii) Trade Varieties of Indian Cottons: Lint samples of fair average quality of the

major Trade Varieties of Indian cottons are being obtained for each season through various organisations. Representative *kapas* samples of these varieties are also procured from the State Departments of Agriculture. The fibre and the spinning test results on each variety of cotton are being published for information of cotton trade and industry. During 1997-98, 11 trade varieties have been tested.

(c) Research Work done on Specific Agricultural and Technological Aspects Relevant to Cotton Improvement Work

Effect on Fibre Qualities and Yield Levels of Cotton due to Application of Neem Products

For the last three years research work has been going on to study the effect on fibre qualities and yield levels of cotton due to application of neem products. The field experiment was conducted in Randomised Block Design (PBD) with three replications and ten treatments.

Treatment Details :

T 1 -NSP 25 Kg/ha at 30 DAS + 5% NSE at 50, 60, 70, 80, 90 and 100 DAS (6 sprays at 10 days Interval)

T 2 -NSP 50 Kg/ha at 30 DAS = 5% NSE at as above .....

T 3 -NSP 25 Kg/ha at 30 & 60 DAS + 5% NSE at a above .....

T 4 -NSP 25 Kg/ha at 30 DAS + 0.035% endosulfan at 60, 75, 90 & 100 DAS. (4 sprays at 15 days Interval)

T 5 -NSP 50 Kg/ha at 60 DAS + 0.035% as above

T 6 -Endosulfan 0.07% at 60, 75, 90 and 105 DAS + Mechanical Collection of bollworms larvae.

T 7 -Neem cake 25 Kg/ha at 30 DAS + 5% NSE as above

T 8 -Neem cake 50Kg/ha at 30 Das + 0.035% endosulfan at 60, 75, 90, 105 DAS.

T 9 -Recommended plant protection measures (R.P.P.)

T 10 - Control (No Treatments)

Analysis of the data given in Table 6, revealed that the treatments of Neem cake through soil followed by NSE by foliar application or neem seed powder through soil and through foliar application were equally effective in minimising the bollworm infestation as compared to chemical insecticides. Neem products are available locally at cheaper rate. Treatment (T7) Neem cake 25 (Kg/ha) at 30 DAS + 5% NSE (6 sprays at 10 days interval from 50 to 100 DAS) may be recommended as plant protection measure for bollworm management for considerable improvement in quality and quantity of cotton.

TABLE 6 : EFFECT ON COTTON FIBRE PROPERTIES AND YIELD LEVELS DUE TO THE APPLICATION OF NEEM PRODUCTS (POOLED DATA)

Treatment	2.5% S.L. (mm)	Fineness µg/inch (Micronaire value)	MC	3.2 mm gauge strength (g/tex)	Boll damage (%)			Yield (Kg/ha)	C/B Ratio
					Green Boll%	Open Boll%	Locule %		
T1	23.5	3.5	0.67	18.2	14.12	17.41	13.59	967	1/1.60
T2	23.5	3.8	0.71	18.4	13.83	17.60	13.67	1026	1/1.71
T3	23.4	3.4	0.65	17.9	13.61	17.63	12.84	1066	1/1.77
T4	23.5	3.5	0.67	18.6	14.48	18.50	13.20	1119	1/1.86
T5	23.9	3.6	0.67	18.0	13.95	17.34	13.20	1067	1/1.76
T6	23.9	3.6	0.68	18.9	13.46	18.53	13.61	1170	1/1.85
T7	23.8	3.6	0.67	18.8	13.99	18.99	13.65	1134	1/1.90
T8	23.8	3.5	0.67	18.8	13.32	18.22	13.30	1097	1/1.81
T9	23.6	3.5	0.67	18.4	14.19	18.00	12.72	1114	1/1.80
T10 (Control)	23.2	3.7	0.69	17.6	20.57	27.15	20.35	558	1/1.00
SE ±	0.26	0.093	0.0144	0.253	0.53	1.22	1.25	66	—
CD(5%)	NS	NS	NS	NS	1.54	3.57	3.45	192	—

Improving of Fibre Properties and Yield Potential of Asiatic Cotton by Unconventional Breeding Methods

Sowing of selected lines was completed on 24th June 1998 at Dhanegaon Agricultural Farm of Cotton Research Station, Nanded in three replications. Germination was satisfactory but due to heavy rains in the month of July 1998, cultural practices could not be done properly. Heavy attack of pests and physiological shedding followed. The crop growth was badly affected.

There were some segregants which proved their tolerance to pests and performed better in adverse conditions. Out of these, four genotypes were selected. They were dwarf, with anatomical structure of diploid species though tetraploid in origin, having chromosome number 2n = 52. These derivatives have resistance to sucking pest complex.

Unconventional breeding method was adopted to intergress desirable genes of diploid cotton species into tetraploid and of tetraploid cotton species into diploid species. Materials have reached the stage of F7 generation.

Four genotypes tending towards diploid cotton species have been promoted and tested in large scale trial along with other derivatives and their performance has been evaluated on the basis of bolling potential and the extent of abnormality. Most of the selected strains recorded 2.5% span length in the range of superior medium to long staple coupled with promising fibre tenacity, as against hirsutum hybrid check NHH 44. Results pertaining to these interspecies cross derivatives are given in Table 7 along with those of local check.

The strain NA-529 recorded promising 2.5% span length (26.5 mm) and high fibre tenacity (23.0 g/tex) with substantially higher ginning out turn (38%).

Application of AFIS for Measuring Maturity and Fineness of Different Varieties of Cotton

Over one hundred samples belonging to different varieties and hybrids covering a wide maturity range were selected for the study. The values of Pm by caustic soda method for all the samples were evaluated as per standard procedure. Sample slivers prepared for measuring Pm were later tested by the L and M module of Advanced Fibre Information System (AFIS) for finding out the maturity parameters, *viz.* IFC and MR as also fineness values in millitex.

Measurements by AFIS were made on 12000 fibres for each sample and the mean values noted along with distributions of θ fineness.

Measurements of both IFC and MR are based on the degree of thickening, θ,

TABLE 7 : FIBRE PROPERTIES AND GINNING OUTTURN OF SELECTED STRAINS

Strains	2.5% S.L. (mm)	Uniformity Ratio	Fineness µg/inch (Micronaire value)	MC	Strength (g/tex)	Ginning Outturn (%)
NA 389	25.5	51	5.1	0.80	21.4	37.0
NA 398	26.1	52	4.9	0.80	22.5	36.0
NA 528	25.4	49	4.9	0.78	19.8	36.0
NA 529	26.5	49	5.0	0.80	23.0	38.0
IS-244/4/1	24.0	46	2.6	0.57	15.8	32.2
IS-181/7/1	25.2	49	3.9	0.72	17.4	31.8
IS-376/4/1	23.2	46	3.6	0.70	16.8	33.0
IS-376/4/2	23.1	49	3.8	0.71	17.2	30.6
80/216	26.5	49	4.7	0.76	19.7	34.0
80/679	24.7	50	5.4	0.80	20.1	38.5
DCH-32	33.4	48	2.8	0.67	23.3	30.8
NHH-44	23.2	48	3.6	0.73	15.5	33.5
Eknath (Ch)	22.5	49	5.2	0.80	20.1	36.2

estimated for individual fibres from the relation :

$$\theta = 4 \pi A/P^2$$

where P is the perimeter of fibre cross-section and A the area of cross-section of the fibre wall. AFIS reconstructs the section perimeter and area of each fibre from the transmitted and scattered lights.

All fibres having $\theta < 0.25$ are considered dead or highly immature and their percentage in a given sample denotes IFC. Percent fibres for which $\theta > 0.5$ are denoted as N (normal) while percent fibres for which $\theta < 0.25$ are denoted as D (dead) fibres and MR is calculated by using the relation:

$$MR = (N-D)/200 + 0.7$$

Samples tested in the present study could be categorised into four groups based on Pm as indicated in Table 8. The corresponding ranges for IFC and MR obtained by testing these samples on AFIS as well as calculation by assuming simple linear relationship between Pm and IFC as well as Pm and MR are also given in the Table 8. Figures in brackets in column 2 indicate the number of samples in each category.

Regression analysis gave a highly significant correlation between IFC and Pm with r = 0.84. An almost equally significant co-efficient of correlation (r = 0.82) was obtained between MR and Pm. Regression analysis and conversion to Pm were attempted as the latter is the most familiar to the cotton breeder, the trader and the textile technologist.

Relationship between Pm and IFC and that between Pm and MR are shown in Figures 1 and 2 along with the best fit lines. Both Figures 1 and 2 show higher scatter at low and intermediate levels of maturity (IFC = 7 to 10 and MR = 0.85 to 0.90).

It may be observed from Table 8 that there is considerable overlap in IFC range for samples in category 1, 2 and 3 when the categorisation is based on Pm from caustic soda method. Pm calculated from IFC shows that for samples of category 1, there is always overestimation of maturity compared to the actually measured Pm. However, the reverse is found to be true for most of the samples from categories 2 and 3. For samples in category 4, there is remarkable agreement between measured Pm and that estimated from IFC. In other words swelling in NaOH influences and alters the maturity of fibres of different average wall-thickness differently. The effect is more in the case of samples of certain varieties in which the average wall-thickness lies in the low and intermediate range. When Pm falls in the range 50-70, the maturity based on actual fibre wall development can be lower at least in some varieties. This is obvious from Figures 1 & 2, where most of the observed values tend to lie above the best fit line. Hence,

for such samples it is better to have maturity estimated by using some index based on raw fibres.

Maturity categorisation based only on raw fibres as suggested by the manufacturers (Table 9), brought only 2% samples tested under the immature category. This does not appear to be quite true when the fibres are observed under the microscope. In the light of the current study, categorisation based on IFC needs to be changed and fibres with IFC > 10% may have to be treated as immature instead of those having IFC > 14%. Between the two measures of maturity provided by AFIS, IFC gives values for Pm closer to the observed values. Comparison of the measured Pm with those estimated from IFC showed relatively good agreement (with absolute difference lying in the range 0-10%) in 85% cases. For the remaining 15% cases, the absolute difference lay in the 10-25% range. On the other hand with MR the calculated Pm showed agreement in a slightly lower percentage of samples tested.

A critical analysis of θ distribution given by AFIS to find out an alternate raw fibre value for maturity which is different from IFC and MR and which lies closer to the value likely to be obtained after swelling in NaOH, is under way.

Fineness measured by AFIS did correlate well with fineness measured by Micronaire. Correlation for individual varieties is found to be much better than the pooled correlation.

TABLE 8 : RANGES FOR MEASURED AND CALCULATED VALUES OF MATURITY PARAMETERS

Category	Maturity Parameters				
	Measured Values			Calculated Pm	
	Pm (Caustic soda)	IFC (AFIS)	MR (AFIS)	from IFC	from MR
1	29-55 (19)	7.7-15.1	0.78-0.88	35-66	45-61
2	56-70 (32)	4.9-11.2	0.83-0.98	51-77	52-80
3	71-80 (33)	3.2–10.7	0.85-1.0	53-84	56-83
4	81 –91 (17)	1.7-5.6	0.93-1.07	74-90	71-96

TABLE 9 : CATEGORISATION OF FIBRES BASED ON AFIS MATURITY PARAMETERS

Sr.No.	Category	IFC	MR
1	Highly mature	4 to 8	Above 1.0
2	Average Mature	8 to 14	0.8 to 1.0
3	Immature	14 to 18	0.7 to 0.8

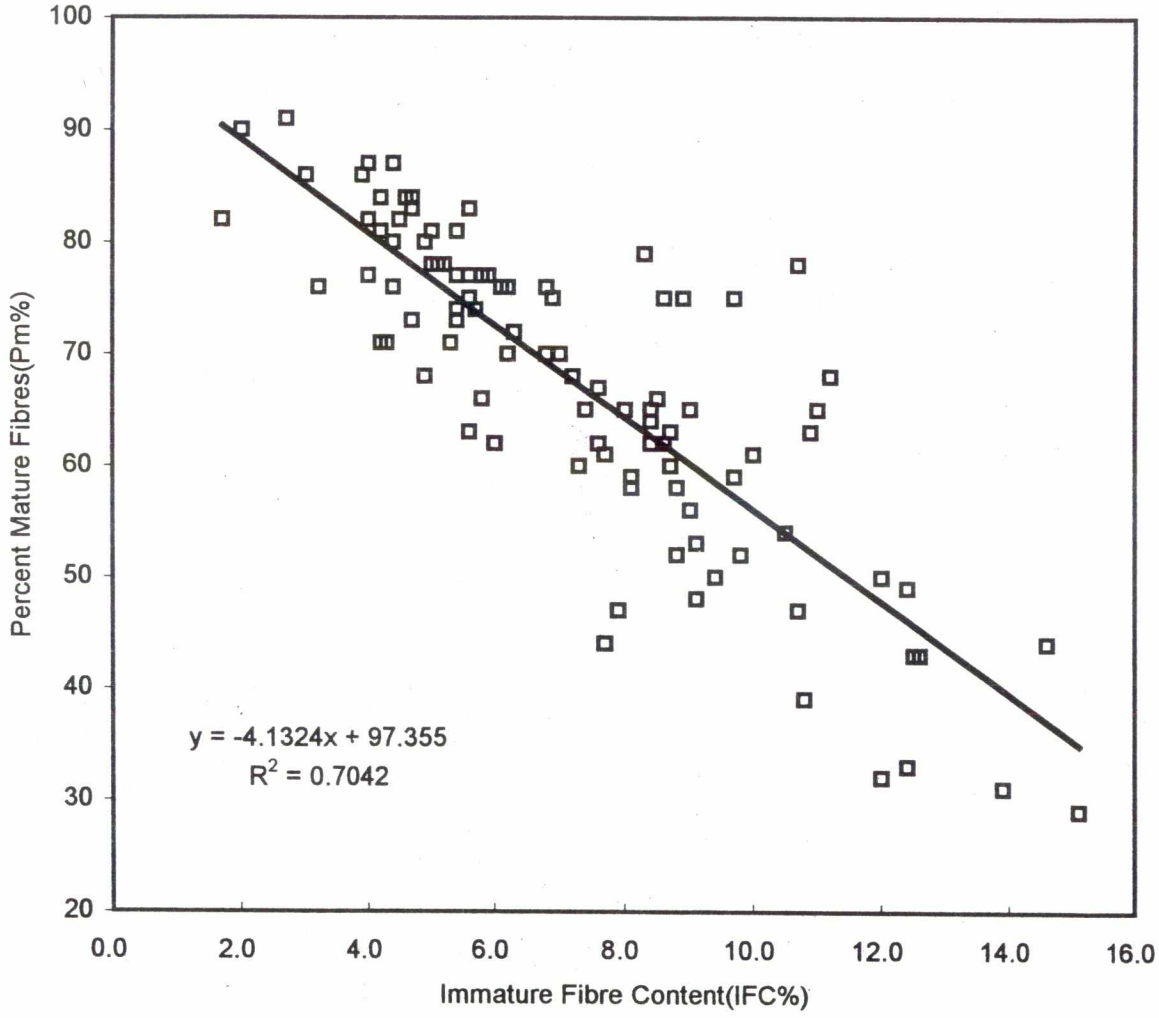


Figure 1: Relationship between IFC and Pm

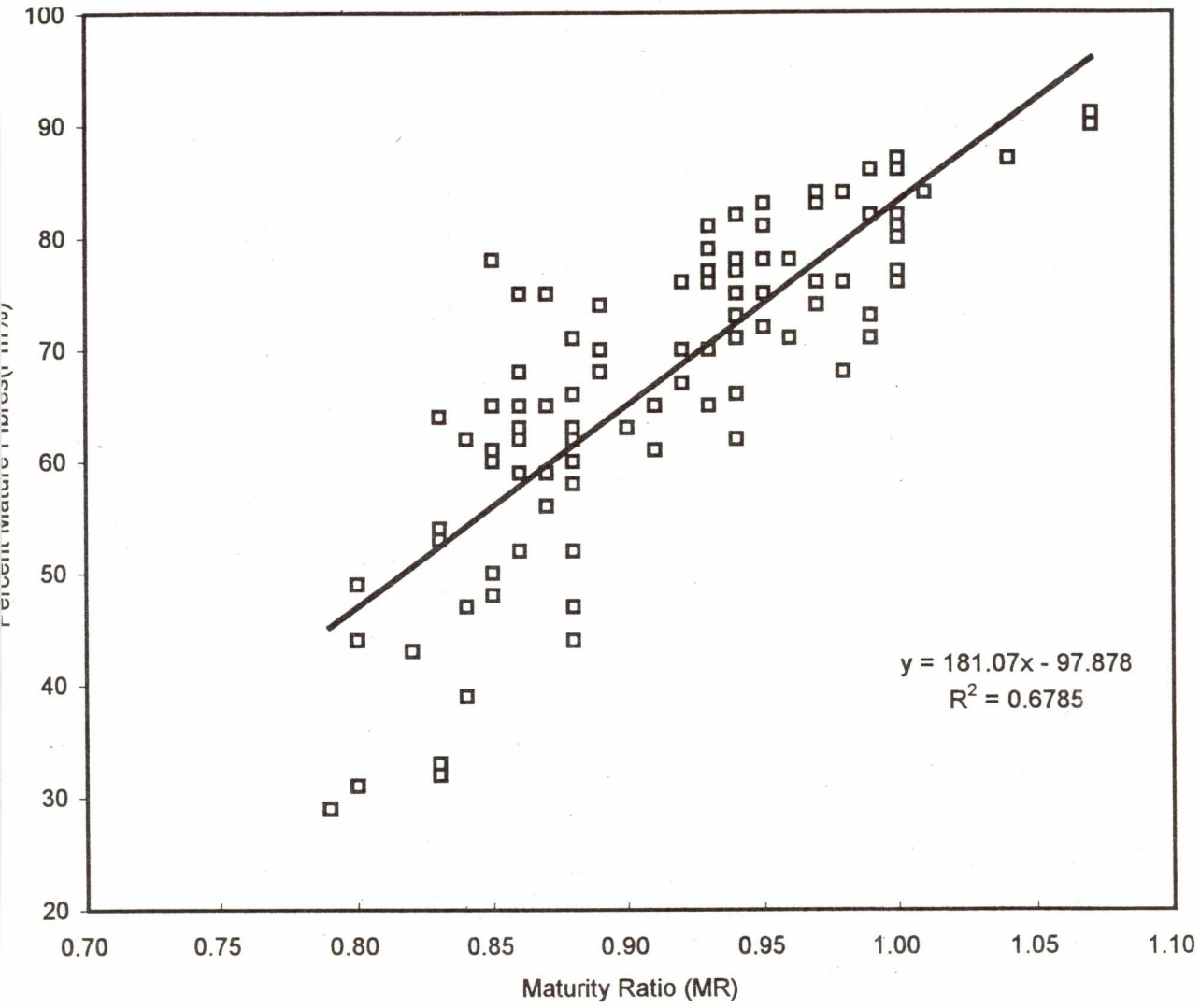


Figure 2: Relationship between MR and Pm

Effect of Agroclimatic Conditions on the Short Fibre Content of Popular Hybrids Grown in Gujarat State

Necessary planning of the field work was drawn up and implemented. Sowings were done as indicated below.

Sr.No	Sowing Time	Date
i)	Advance sowing	16-06-1998
ii)	Normal sowing	02-07-1998
iii)	Late sowing	06-08-1998

There were three replications based on split plot design.

A) Main Plot: Sowing times - 3
B) Sub plots : 16 (4 varieties x 2 K levels x 2 pickings)

Sowing time		Varieties	K levels	Pickings
i)	Advance sowing	i) G.Cot.DH.7	i) No potash	i) First
ii)	Normal sowing	ii) G.Cot.DH.9	ii) 80 kg K_2O/ha	ii) Second
iii)	Late sowing	iii) G.Cot.Hyb..8 iv) G.Cot.Hyb.10		

All agricultural operations were done according to schedule.

The picking dates were as follows :

1) For advance sowing
   a) on 18-12-1998
   b) on 12-01-1999
2) For normal sowing
   a) on 11-01-1999
   b) on 16-02-1999
3) For late sowing
   a) on 15-02-1999
   b) on 30-03-1999

The testing work for short fibre content and other parameters with AFIS instrument is in progress.

Fibre Quality Studies on Newly Developed Strains/Hybrids under Specially initiated Breeding Programme for Improvement in Fibre Tenacity and Extensibility

Improved variety NH.452 and other genotypes, *viz*. NH.545, NH.529 and parental lines (AC.738 and BN.1) of popular hybrid NHH.44 are involved in the improvement programme. Donor parents having high fibre tenacity are being procured from the Central Institute for Cotton Research (CICR), Nagpur and the Indian Agricultural Research Institute (IARI), New Delhi.

High tenacity germplasm lines (donor parental and *barbadense* genotypes) are being used in specially initiated breeding programmes for improvement in fibre tenacity and extensibility. For breeding, biparental mating and back crossing will be adopted.

Design Modifications on Pneumatic Splicer for Improved Splicing Action

During the reporting period, two

baffle plates were suitably positioned at the exit paths of the released air from the mingling chamber after blast. The distance of the plates relative to the chamber was adjusted after a few trials for preparation of optimum appearance and quality of spliced yarn. The baffle plates are likely to stabilise the air-release from the mingling chambers. Besides, some spirality was introduced in the inner surface of the inlet nozzle assembly prior to the mingling chamber. This arrangement was expected to increase the air-rotation even at a low pressure of air supply to the chamber.

The conditions and settings for optimum performance of the modified splicer was next determined by conducting a series of experiments following a second order rotatable experimental design of (3x3). The supply of air pressure was varied from 3 to 5 kg/ cm^2. Splice samples were prepared with 15 specified treatment conditions. For each treatment, 25 splice specimens were tested on the Tensorapid equipment for the average strength and its variation. Under optimum conditions, RSS of about 73% with 11.3% C.V. of breaking strength was noted for 40s cotton yarn. Thus, the modifications are capable of producing spliced yarns of good RSS with substantially lower C.V. of strength. It is to be noted that very high RSS will only marginally improve the efficiency of post spinning operations. What is most desirable in the spliced yarn is the attainment of a standard level of RSS (about 65% and above) with low variability and good appearance quality.

Morphology of Cottonseed Surface in Relation to Fibre Development and Seed Coat Removal

During the year, ten varieties covering the three botanical species *i.e.* G. *arboreum*, G. *herbaceum* and G. *hirsutum* which generally show the presence of seed coat fragments in ginned cotton were selected for the study.

Two hundred seeds taken from each variety were examined under optical zoom microscope and percentages of intact seeds and seeds without chalazal cap were determined. It was observed in all these samples that except the chalazal cap no other part of the seed coat was removed. This showed that if the *kapas* is ginned carefully the chalazal portion of the seed coat alone causes presence of seed coat fragments in a cotton.

The percentage of seeds with chalazal cap detached during ginning in all the ten varieties is given in the Table 10. Different varieties irrespective of the species to which they belong, show large variations (11% - 72%) in the incidence of chalazal cap removal. In some of the seeds, a portion of the tissue pertaining to the xylem part of seed coat was also detached from the seed along with the chalazal cap. This was examined in SEM (Fig. 3).

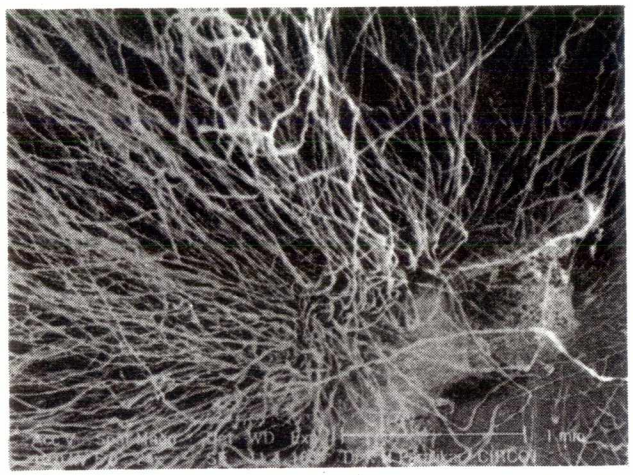


Fig. 3 (a) : Seed Coat Fragment with Fibres attached to it (Magnification 24 X)

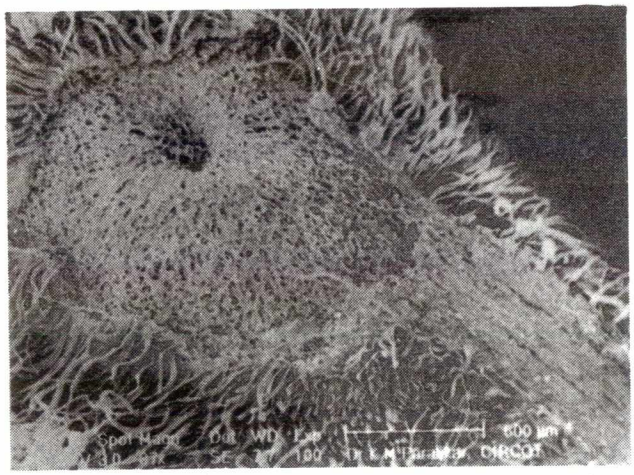


Fig. 3 (b) : Electron Micrograph showing Portion of the Seed from where the Chalazal Cap and tissue having Xylem part is detached during Ginning Process (Magnification 37 X)

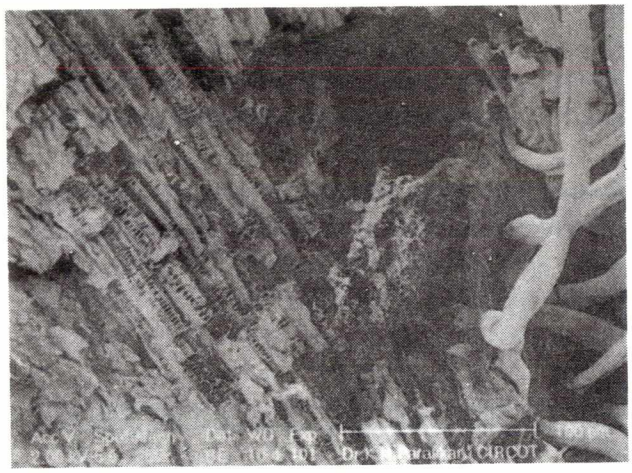


Fig. 3 (c) : Magnified View of the Detached part of Tissue (Magnification 259 X)

TABLE 10 : RESULTS OF OPTICAL MICROSCOPY OF GINNED COTTON SEEDS TAKEN FROM DIFFERENT VARIETIES

Sr. No.	Cotton Variety	Seeds having chalazal cap intact (%)	Seeds without chalazal cap (%)
G. arboreum			
1.	RG.8	47	53
2.	AK.235	66	34
3.	LDH-11	70	30
G.herbaceum			
4.	Jaydhar	89	11
5.	Wagad	28	72
G.hirsutum			
6.	LRA.5166	68	32
7.	Akshaya	74	26
8.	H.777	57	43
9.	F.846	51	49
10.	HS.6	39	61

Note :. Figures (%) given above are based on examination of 200 seeds from each variety

Further work on collection of seed coat tissue along with chalazal cap from seed cotton samples by hand pulling is in progress for determination of lignin content which contributes to the strength of seed coat.

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

Alkaline Treatment of Polyester Fabrics

Different treatments involving NaOH, glycerine and ethylene glycol were attempted on polyester fabrics to improve their moisture and dyeing behaviour.

Pretreatment of fabrics comprised scouring with mild detergent, and drying in infrared oven for 15 min. The oven dry weight was taken as the initial weight for all the treatments.

Initially 1% (w/w) solutions of NaOH in water, glycerine and ethylene glycol (EG) were used. Treatment at 50°C showed no weight loss or change in moisture regain at 65% R.H. Samples were then treated at 20°C. Moisture regain for the control fabric at 65 % RH was 0.128. Table 11 gives wt.loss and moisture regain for different treatments.

It can be seen from the table that NaOH in water gives maximum weight loss followed by E.G. and glycerine in that order, for the same concentration and time of treatment. However, moisture regain of fabric treated with EG is always higher than those in other two treatments. Dyeing studies are under way.

Synthesis of Eco-Friendly Azo-dyes

An exhaustive literature survey was carried out to gather information on the toxicity of various aromatic amines and dye intermediates, but of the few that were identified as safe alternatives, one such amine, namely Aniline 2,5, disulphonic acid was taken up for the study.

The above chemical was procured from one of the dye intermediates manufacturing units. Employing the

TABLE 11 : WEIGHT LOSS AND MOISTURE REGAIN FOR DIFFERENT TREATMENTS

Sample No.	Treatment Particulars	Wt. loss (%)	Moisture regain at 65% R.H.
1.	1% in water : 15 min	1.533	0.044
2.	1% in glycerine : 15 min	0.218	0.087
3.	1% in E.G. : 15 min	1.008	0.139
4.	2% in water : 15 min	1.268	0.099
5.	2% in glycerine : 15 min	0.452	0.045
6.	2% in E.G. : 15 min	0.480	0.131
7.	1% in water : 60 min	1.901	0.176
8.	1% in glycerine : 60 min	0.472	0.302
9.	1% in E.G. : 60 min	1.526	0.419
10.	2% in water : 60 min	1.832	0.222
11.	2% in glycerine : 60 min	0.562	0.348
12.	2% in E.G. : 60 min	0.561	0.347

above safe aromatic amine and several coupling agents that are reported safe, seven dyes were synthesised. These dyes were found to impart bright red, orange and yellow colours on wool and Nylon. Most of the dyes synthesised exhibited good colour fastness characteristics. The rubbing fastness of the dyes was also good. Work is in progress to purify the above dyes and study other dyeing parameters.

Isolation, Characterization and Application of Natural Dyes

A highly acidic industrial effluent known as Ph Liquor produced during the pre-hydrolysis of eucalyptus wood chips with acid in viscose manufacture, was obtained from the National Handloom Development Corporation (NHDC) Lucknow. Upon neutralisation, this liquor has been found to dye cotton fabrics premordanted with tannic acid and alum to a 'buff' shade. In the experiments different concentrations of this liquor, *viz.* 25%, 50%, 75% and 100%, were used. Dyeing conditions like pH, dye bath temperature and concentrations of tannic acid and alum were optimised. Dye bath though not exhausted, could be reused for dyeing another sample. Replacing alum with ferrous sulphate produced a brown colour. Colour co-ordinates of the dyed samples were determined. Dyed samples possessed good light fastness and wash fastness. Other fastness properties are being determined.

Marigold (*Tagetus erecta*) flowers purchased from local flower market were air-dried in shade. Three extraction methods, *viz.* aqueous extraction, acidic extraction (extraction with water containing few drops of HCl) and alkaline extraction (extraction with 1% sodium carbonate solution) at boil for 20 minutes were tried to extract dye from the dried flowers. Absorbancy values of the extracts measured with a spectrophotometer at 350 nm (wavelength of maximum absorption) after dilution suggested that acidic extraction was the best followed by the aqueous extraction. Efficacy of alkaline extraction was much less. Tannic acid and alum mordanted cotton could be dyed to a yellow colour in acidic and aqueous extracts at room temperature itself. Exhaustion was good and the colour was brighter for the acidic extract. On the other hand, exhaustion was poor in the alkaline extract and only a dull yellow colour could be obtained. Dyed samples had good light fastness property.

Extraction of natural dyes from hard materials like roots, barks, etc. requires boiling for a long time. To assess whether the use of cellulase enzyme can reduce the boiling time, thus saving energy, **manjith** (*Rubia cordifolia*) roots, purchased from a local supplier were powdered and 2 g of this powder was incubated with cellulase enzyme and water at 50°C for 2 hours. It was then boiled for 5 minutes to arrest the enzyme action, centrifuged and the supernatant extract was collected. Different concentrations of the enzyme

viz. 0.25 ml, 0.5 ml, 0.75 ml and 1.0 ml (after initial 1 - 10 dilution) were used. Another sample treated in a similar way but without the addition of the enzyme served as control. All the extracts were made up to the same volume and absorbance was measured on the spectrophotometer at 400 nm. Absorbance values were higher for the enzyme treated samples by 4-35% in comparison to control. However when cotton fabrics mordanted with tannic acid and alum were dyed with these extracts, it was the control sample which dyed better. Reason for this discrepancy is being investigated and various conditions for enzyme treatment are being standardised.

Experiments conducted to dye cotton with the leaves and twigs of *Strobilonthes flaccidifolius*, a plant growing in N.E. region, using fermentation, aqueous and enzymatic dye extraction methods, were not successful. Only a faint blue colour was obtained.

Effect of Enzymatic Treatments on Properties of Woven Fabrics

Two types of cotton fabrics were purchased from the local market: One of the fabrics was a medium quality shirting, and the other a rough quality poplin. The fabrics were desized and their constructional characteristics were determined. The enzyme, cellulase, was obtained from the market and analysed for its activity.

To determine the optimum conditions of enzyme finishing, the fabrics were treated with enzyme solution at 3 different concentrations, *viz.* 0.5%, 1.0% and 1.5%. The treatment was carried out for a fixed time of 1 hr. The enzyme treated fabrics were washed, dried and tested for tensile strength, air permeability and drapeability. It was observed that the enzyme treatment reduced the weight of fabrics, and their tensile strength, but improved their drapeability. The weight - loss and strength deterioration of fabrics were greater at higher concentrations of the enzyme. In the case of medium quality fabric, the strength deteriorated by about 15% at 0.5% enzyme concentration and reduced further by about 30% at 1.5% enzyme concentration. The strength loss was about 10% for 0.5% for enzyme treated coarse fabric and about 39% for 1.5% enzyme treated coarse fabric. But as the concentration of enzyme increased, fabrics became more permeable to air. The extent of change was greater for medium quality fabrics.

Production of Cellulase and Amylase by Solid State Fermentation

In recent years, solid state fermentation is widely being used for the production of enzymes, antibiotics, etc. Earlier, work has been carried out at CIRCOT on production of cellulase and amylase by *Penicillium funiculosum* and *Bacillus subtilis-159* by using submerged fermentation process. Since the process involves high capital cost, an attempt has

been made to produce these enzymes by solid-state fermentation.

Wheat bran, a cheap carbon and nitrogen source, was used for the proliferation of the organisms. Analysis of wheat bran revealed that it contained 56.8% cellulose, 17.2% protein, 10.5 % crude fibre, and 7.4 % fat.

Conditions, such as substrate-to-liquid ratio inoculum size and incubation period were standardised for the production of cellulase and amylase by *P. funiculosum and B. subtilis - 159*. Cellulase activity was expressed in terms of filter paper, endoglucanase and avicelase activities, while amylase was measured by starch-iodine method. The results indicated that *P. funiculosum* produced maximum cellulase having filter paper activity equivalent to 45.0 mg of reducing sugars (as glucose) per gramme of substrate in 1 hr at a substrate-to-liquor ratio of 1 : 7.5 with 4.0 ml inoculum and 5 days incubation period.

Maximum amylase by *B. subtilis - 159* obtained was 570 units per g of substrate in 15 min at a substrate-to-liquor ratio of 1 : 3, and 4.0 ml inoculum in 5 days.

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

Enrichment of Cellulosic Materials with Microbial Properties for Improved Digestibility

Cottonseed hulls are conventionally fed to cattle despite their poor digestibility. The presence of high lignin content is the primary cause of low digestibility. In order to improve the digestibility, the hulls were subjected to an inexpensive anaerobic treatment with a mixed microbial consortium for 7 days at room temperature. Subsequently, the material was washed in water and dried. Another set of anaerobically treated material was inoculated with *Pleurotus sajor caju* and incubated for 7 days. The material was then dried.

The materials from both the sets were analysed for various chemical constituents. The results indicated that significant loss of hemicellulose occurs in both the treatments indicating the utilisation of this material during anaerobic and aerobic catabolism. There was improvement in the percentage digestibility based on the IVRD test. In the case of mushroom grown material there was significant loss of total organic matter despite desirable change in the digestibility.

In view of the above encouraging results, about 100 kg of cottonseed hulls was subjected to anaerobic treatment alone and sent to Punjabrao Krishi Vidyapeeth, Akola for feeding trials on cross breed cows. The data on feeding trials are awaited.

Cotton plant stalk is not a conventional cattle feed but it is a rich lignocellulosic

material.An effort has been made to improve the digestibility and acceptability by cattle as a feed by subjecting the material to anaerobic treatment followed by inoculation with *Pleurotus sp.*

Microbial Retting of Bast Fibres for Textile Purpose

The growing concern for preservation of the environment has led to renewed interest in research on biodegradable lignocellulosic fibres of plant origin. Among the natural fibres, ramie occupies a prime position due to its high strength, lustre, durability and resistance to microbial attack.

Even though the present production of ramie has been negligible, it is going to be one of the important fibres in coming years, in view of the large scale cultivation envisaged in parts other than the N.E. region which has been the traditional home for the fibre. Ramie fibre is obtained from the plant *Boehmeria nivea* (Linn.) Gaud which is semi-perennial and grows to a height of about 2 metres in just one to one and a half months and can be maintained for about 8 years without the need for replanting.

Decorticated ramie fibres contain about 12-30% of gum. For using them in textile applications, degumming is a pre-requisite. Conventional chemical degumming involves cooking at high temperatures for a prolonged time and hence is an energy intensive process. Conventional enzymatic degumming demands treatment with a series of enzymes to effectively remove the gum at a specific pH and temperature, with the risk of losing fibre strength.

CIRCOT has standardised a method for degumming ramie fibres under anaerobic conditions at room temperature.

In order to confirm the applicability of this technique, detailed studies were undertaken with regard to the structural properties and spinning performance. Decorticated ramie fibres were procured from the regional station of CRIJAF, at Sorbhog in Assam. One set of fibres was degummed by the conventional kiering process and another by the anaerobic treatment standardised at CIRCOT. The processed fibres were analysed for residual gum percentage, moisture regain, strength and fineness. The results are given in Table 12. It is evident that kiered fibres have only 8.9% residual gum as against about 19.0% gum in the decorticated fibres. The anaerobically retted fibres had a gum content of 7.5%. Its strength (56 g/tex) was however *on par* with that of kiered ramie (48.9 g/tex). It has better softness, smoothness and lustre.

Anaerobically degummed ramie fibres were cut into staples of 35 mm length with a locally fabricated fibre cutting machine. They were blended with

TABLE 12 : PHYSICAL AND CHEMICAL PROPERTIES OF RAMIE FIBRES

Treatment	Properties			
	M.R. (%)	Gum Content (%)	Tenacity (g/tex)	Extension (%)
Decorticated Fibres	9.4	18.5	55.7	2.9
Kiered Fibres	8.8	8.9	48.9	2.9
Anaerobically Retted	8.9	7.5	54.8	2.5

TABLE 13 : MICROSPINNING TRIALS ON BLENDS OF RAMIE FIBRES (NOMINAL COUNT SPUN: 40s Ne)

Blend	Ramie / PE	Ramie/Carded Cotton		Ramie/ Combed Cotton	R / P / C	Ramie / (mercerised) Carded Cotton
Composition	50 : 50	50 : 50	33 : 67	33:67	33:33:33	33:67
Actual Count Spun (Ne)	39.4	37.5	37.5	40.3	37.6	39.9
Actual Strength (lbs.)	60.4	43.5	52.9	49.5	65.3	45.3
Core Lea CSP	2371	1586	1934	2002	2497	1805

polyester (1.2d x 38 mm) and cotton (MCU.5) both in carded and combed forms. The blend compositions were varied suitably to find out optimum properties of ramie fibres for maintaining satisfactory spinning performance. The samples were spun by CIRCOT microspinning technique. The results are given in Table 13. It has been found that about 33% ramie could be blended with cotton while with polyester, the blending can be done up to 50%.

Spinning of a tertiary blend with equal proportions of ramie, polyester and cotton fibres was found to be satisfactory on the ring frame. Deterioration in CSP was observed with mercerised ramie fibres in the blend.

Scale-up Studies on Preparation of Microcrystalline Cellulose from Sisal Fibres

For a rigorous test of the method evolved at CIRCOT for preparing micro-crystalline cellulose a scale up trial was conducted.

The pulp from sisal fibres was prepared by standard kraft pulp making process. The pulp was washed thoroughly

and bleached with hypochlorite in two steps. About 700 g of microcrystalline cellulose was prepared by hydrolysing the pulp using hydrochloric acid at elevated temperature. Yield of microcrystalline cellulose from pulp of sisal fibres was about 40%. Microcrystalline cellulose thus prepared was tested in the laboratory for various properties such as ash, DP, crystallinity, bulk density, partical size, moisture, etc. and the data compared with those on standard microcrystalline cellulose used in pharmaceuticals as binders for tableting (Table 14).

EXTERNALLY AIDED PROJECTS

Objective Analysis of Fabric Quality - Handle, Comfort and Durability Parameters of Apparel Fabrics

The air permeability was determined on fabrics by measuring the quantity of air passing over a fabric held under a pressure difference of 1cm of water column. It was noted that the sectional permeability of all fabrics, irrespective of the fibre type, depended strongly on the porosity of the fabric. While the sectional air permeability was found to be positively influenced by inter-yarn space in the fabric, the intra-yarn space had a negative influence on it. When cotton fabrics of identical warp and weft counts and similar numbers of ends and picks were used, the sectional air permeability was found to be high when coarser cotton was used.

To characterise wear comfort of fabrics, diffusive transport of moisture through fabrics was studied and the time taken by the fabric to allow the relative humidity to build up to a certain pre-determined level in a dry chamber was measured. It was noted that the moisture transfer time was higher for cotton fabrics as compared to polyester fabrics. However, as cotton fabrics are able to displace through absorption greater amounts of moisture in a given time as compared to polyester fabrics, they are more comfortable to wear.

Utilisation of Cotton Plant Stalks and other Crop Residues for Making Pulp and Paper through Anaeronic Digestion

Scale-up trials were undertaken to soften cotton plant stalks, wheat straw and rice straw by a biological route in the anaerobic digesters constructed for the purpose. A number of trials were undertaken and the results are *on par* with the chemically prepared ones. The amount of chemicals and energy saved is very significant. The techno-economic feasibility report is being prepared. Simultaneously, efforts are underway to transfer this technology to a couple of paper mills.

Preparation and Marketing of CIRCOT Calibration Cotton Standards

During the period, 4 fibre testing instruments, 2 cotton samples, 2 antifungal chemicals and 3000 cylindrical polythene bags to provide additional

TABLE 14: ANALYSIS OF MICROCRYSTALLINE CELLULOSE

Sr. No.	Test	Standard Specifications	Sisal MCC S-90	Sisal MCC S-180	Coton Stalk C 300
1.	Appearance	White or off white coarse to fine powder free from any extraneous matter	White, not smooth and not free flowing contains block particles (>10/5g)	White, Not smooth and not free flowing contains black particles (>10/5g)	Off white smooth and free flowing contains n;acl particles (>10/5g)
2.	Odour	Odourless	Odourless	Odourless	Odourless
3.	Moisture	Max. - 5%	4.8	5.2	6.4
4.	Sulphated Ash	Max. - 0.2%	0.57	0.47	0.41
5.	pH	5.5-70	6.9	6.9	6.9
6.	Assay	97 - 102%	96.1	98.6	97.2
7.	Identification	Should pass the test **as per I.P.**	Passes	Passes	Passes
8.	Starch	Absent	Absent	Absent	Absent
9.	Bulk Density	0.54-0.6 g/cc 50	0.24 0.34	0.21 0.32	0.61 0.81
10.	Passing Sieve Test	Mesh No. % Passing	% Passing	% Passing	% Passing
		60 100 100 99 200 75	99 98 78	99 98 72	99 98 54

protection to the packed cotton were procured. To widen the range of calibration cotton set, two cottons, *viz.*, one extra long (for length calibration) and the another coarse (for Micronaire calibration) were procured. The mechanical processing these cottons are in progress.

In all 210 containers were sold, earning a sales revenue of Rs. 1,20,295/- and plans for inducting sales agencies and starting a separate bank account for this scheme were finalised. Publicity drive was undertaken by issuing advertisements in four textile journals and two multi-colour leaflets were printed. [CIRCOT Leaflet Nos. 8 & 9]

It is evident that Indian mills can successfully overcome the problem of USDA's stoppage of ICC cotton supply by using the equivalent CIRCOT calibration cotton.

A paper entitled *Reference Materials for Cotton Testing* was presented in the DUREM-2 Conference organised by Central Pollution Control Board (CPCB) at New Delhi on 10-12 February, 1999.

The work by CIRCOT was highly appreciated in Reference Material Task Force (REMTAF) meeting held on Feb.12, 1999. CIRCOT has been recognised as the Nodal Agency for the preparation of textile standard reference material, and Director of CIRCOT, has been nominated as a member of Technical Advisory Committee of REMTAF.

Effect of Yarn Structure on the Dyeing Behaviour of Cotton and Polyester Blended Yarns/Fabrics

The contributions of disperse and the reactive dyes to the overall colour of ring spun (RS) and rotor spun (OE) yarns of 45^s count with 50:50 polyester/cotton blend composition were studied. It is noted that in both the yarns the contribution of disperse dye to the overall colour is higher than that of the reactive dye component. An indirect evidence was also obtained for a possible difference in the distribution pattern of the polyester and cotton components on the surface of RS and OE yarns.

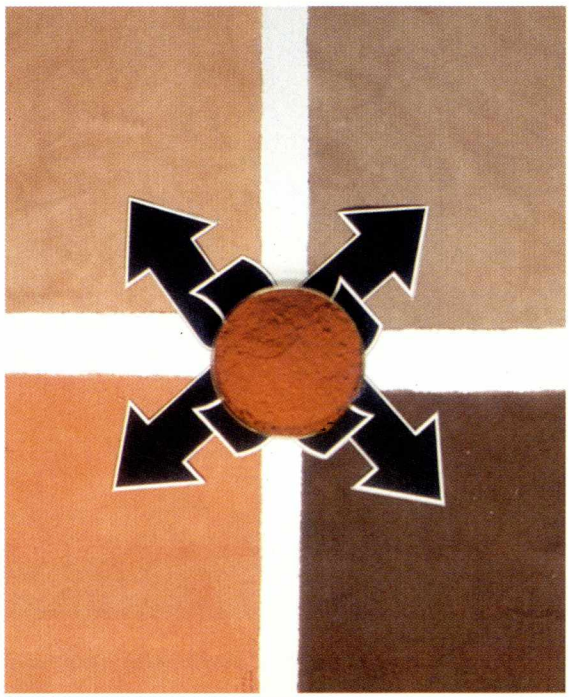
In another study RS and OE yarns of 67: 33 P/C blend composition were dyed and evaluated for light and washfastness properties. The lightfastness rating of both RS and OE yarns by visual grading was the same ard both the samples exhibited good light fastness property. The wash fastness was evaluated by instrumental as well as visual methods. Though the visual grading did not show any significant difference between the RS and OE samples, the instrumental grading expressed in terms of D E values did show difference between the two.

Estimation of Fibre Maturity from Micronaire Value

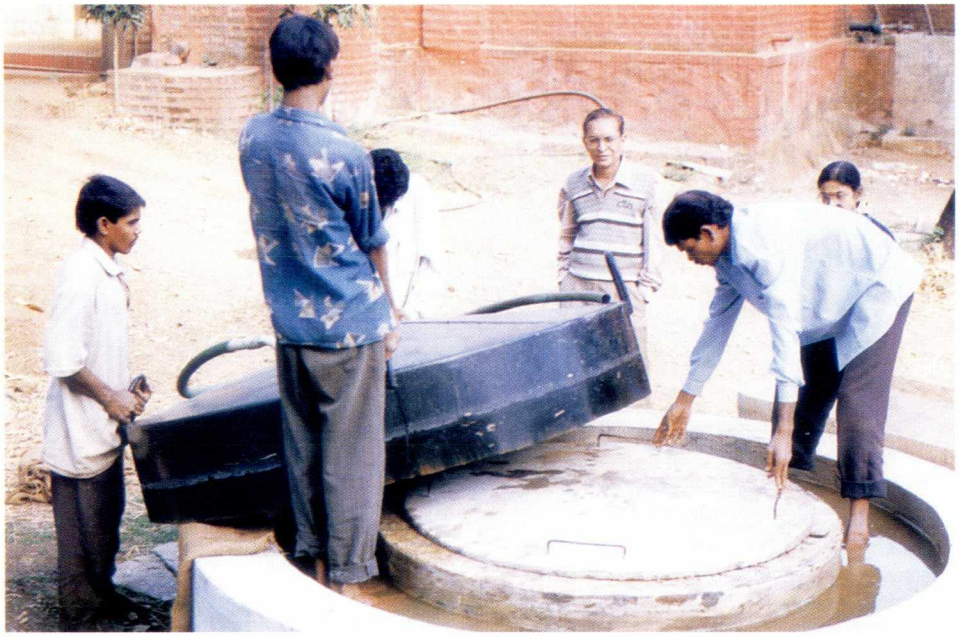
Data obtained so far on four varieties

RESEARCH AND DEVELOPMENT

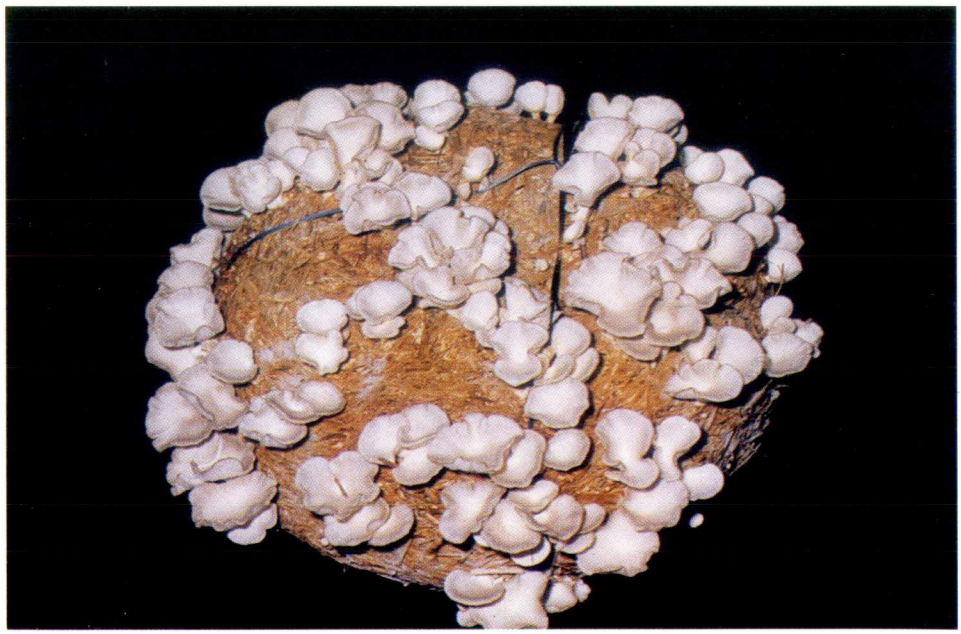
⇦ *CIRCOT Biopulping Plant*



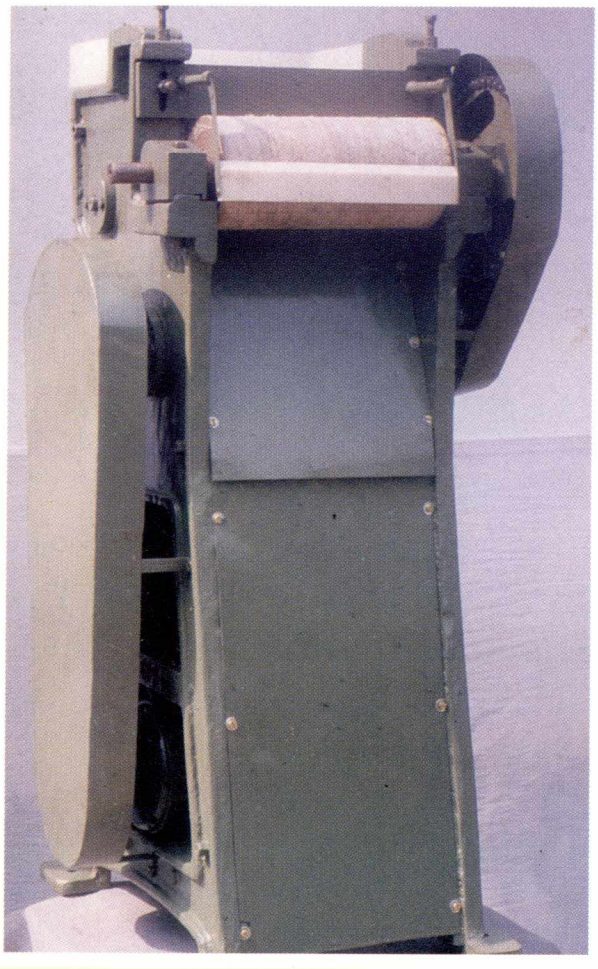
otton Fabrics Dyed with the Natural
)ye - Manjith, in Different Shades ⇨



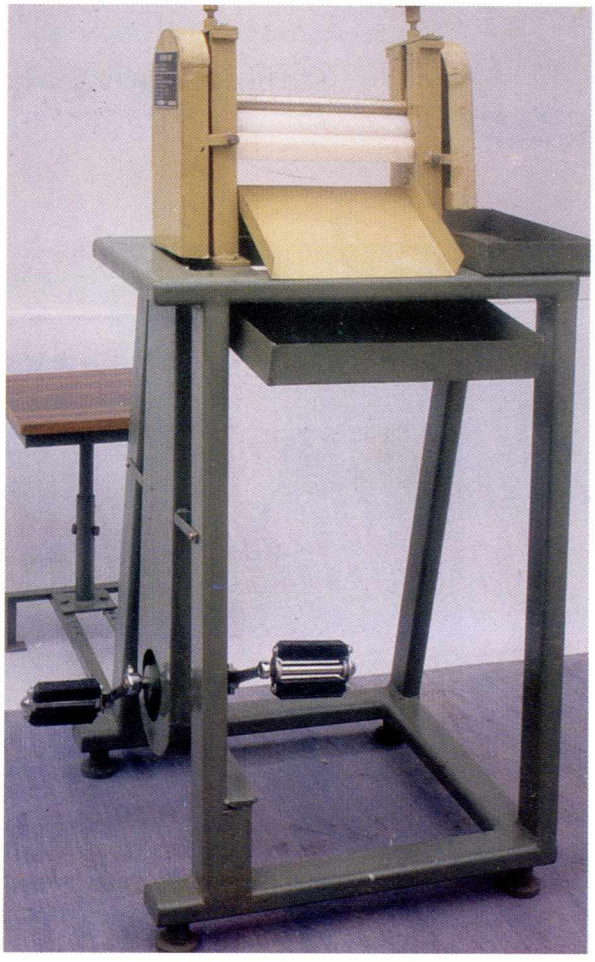
Anaerobic Plant for Pre-treatment of Cellulosic Substrates for Growing Oyster Mushrooms



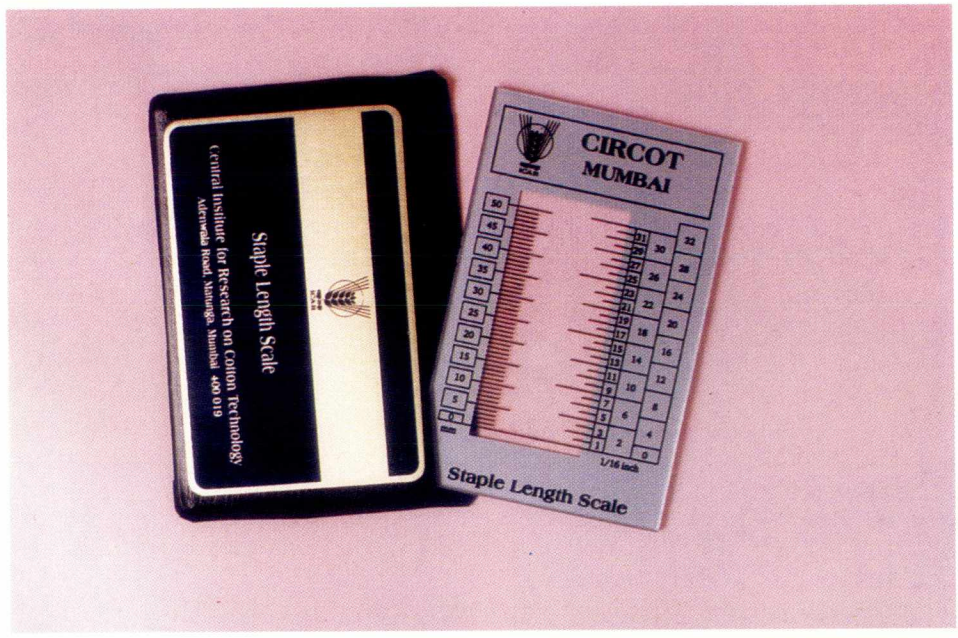
Oyster Mushrooms on Cotton Stalk after Pre-treatment



⇦ CLOY Gin Developed at GTC of CIRCOT at Nagpur



Kisan Gin Developed at GTC, Nagpur ⇨



Staple Length Scale Designed at CIRCOT

CIRCOT Leaflets

S.6, V797, NHH.44 & LRA.5166 confirm the fact that the cross sectional perimeter is a varietal characteristic and that it varies little among fibres of different maturity levels within a variety. The relationship between Maturity ratio (MR) obtained from AFIS and Micronaire value is very strong (r = 92** significant at 1% level) and that between degree of thickening θ and Micronaire value is high (r = 0.82* significant at 5% level), but somewhat subdued. The latter relationship is also variety dependant. It is pertinent to add here that MR obtained from AFIS is also based on degree of thickening.

3

Technology Assessed and Transferred

CIRCOT Launches New Consultancy Package for Ginners

One of the principal mandates of CIRCOT is to serve the ginning industry in India. The Ginning Training Centre of CIRCOT at Nagpur established in 1984 has facilities for training gin fitters, supervisors and managers in the past many years. Professionals from cotton trade and industry have received training at GTC.

In order to strengthen the interaction with ginning industry, CIRCOT has launched a Technical Consultancy scheme under which the Institute will offer a package of benefits against payment of an annual consultancy fee. The scheme was formally announced in the meeting held on September 20, 1998 at Dhrangadhra where about a hundred ginners had gathered. The CIRCOT package comprises the following benefits for the ginneries.

(i) Technical advice on matters relating to productivity and efficiency of the unit.

(ii) Training of personnel in gin operation and maintenance.

(iii) Advice on modernisation.

(iv) Supply of information on ginning of cotton in India.

The distinguishing feature of the training component in CIRCOT package is that the institute will conduct such programmes in towns where many ginneries are located rather than at the GTC Nagpur, which means CIRCOT will now go to the ginner instead of calling him to Nagpur for training.

Ginning Training

Three Training programmes were organised by the Ginning Training Centre of CIRCOT at Nagpur in the months of March, May and August 1998. A training programme under the consultancy scheme was also organised at Dhrangadhra in November, 1998. The courses covered four major aspects of cotton technology, *viz*. Precleaning, Ginning & Bale Packing Machinery, Material Handling Systems & Structures,

Fibre Quality Evaluation and Marketing. The main objective of the training programmes has been to give the participants an exposure to the newly emerging frontier technologies of cotton ginning and pressing techniques and to provide training in gin setting & gin maintenance. The training course involved a series of lectures and practical sessions on the use of various machines. Certificates were issued to participants on successful completion of the training .

Consultancy for Bajaj Steel Industries Ltd. Nagpur

CIRCOT has signed a consultancy contract with M/s. Bajaj Steel Industries Ltd., Nagpur for providing technical advice on product improvement in respect of DR Gin being marketed by the latter. The five year contract will promote production of good quality ginning machines needed for the ginning industry in the country.

4

Education and Training

Education

The recognition granted to CIRCOT by the University of Bombay as a Post-Graduate Institution was continued during the year. Nine students were being guided for M.Sc. and eight for Ph.D. Eleven scientists of the Institute continued as guides for M.Sc. and Ph.D. in various disciplines such as Physical Chemistry, Organic Chemistry, Bio-Physics, Microbiology, Spinning, Textile Physics and Textile Technology.

Training

a) Integrated Training Course on Cotton Quality Evaluation :

In the two-week training programme on cotton quality evaluation, 65 sponsored personnel from cotton trade and industry were trained. Cotton Corporation of India, Maharashtra State Co.op. Cotton Growers' Marketing Federation, East India Cotton Association and from private trading companies and mills. The courses were conducted in 11 batches of four weeks' duration for the sponsored personnel.

A special training programme of one week was organised for personnel sponsored by RITES. Also, two third year B.Tech. (Textiles) students from Sri Guru Gobind Singh College of Engineering and Technology, Nanded were imparted one month's special training.

b) Ginning Training :

At the GTC, Nagpur training was given to 137 sponsored personnel in different batches from ginning factories and cotton trade organisations.

5

Linkages and Collaboration

CIRCOT has no agricultural farm attached to it at the headquarters but all the Regional Quality Evaluation units located within the agricultural university premises in the major cotton growing tracts in the country serve as extension units for the Institute. The staff at these units collaborate with the scientists in these agricultural universities through collaborative research projects. These research projects are aimed at solving the problems faced by the farming community in the country. Assistance is also rendered by way of development of useful equipments required by them, by giving suggestions, by discussions, etc. on the technological aspects of cotton at different stages of crop development, post-harvest technology operations and gainful utilisation of cotton crop by-products and agro-wastes.

CIRCOT has regular interaction with CICR, Nagpur and has collaborative programmes with institutions like NABARD, NHDC, etc.

The Director and Scientists of CIRCOT are members of various committees constituted by the Bureau of Indian Standards for cotton and textile testing and they participate in various seminars, symposia, conferences, etc. in the country so that the knowledge and their expertise in various fields are passed on to the user groups. Director and many scientists are members of advisory panels of institutions like ATIRA, BTRA, SITRA, VJTI, BUDCT, etc.

Being experts in the field of cotton technology and allied areas, some of the scientists are invited from time to time to give lectures and to participate in various discussions in other organisations. They also publish their research findings, apart from participating in exhibitions displaying technologies developed by them, improvement processes, technologies on by-products and waste utilisation, etc.

Periodical publication of articles based on orginal research findings in national and international journals forms yet another part of the extension work.

The Institute conducts regular training courses both at the headquarters and at the Ginning Training Centre (GTC), Nagpur. At the headquarters, integrated training course on cotton

quality evaluation including elementary statistics applicable to textile testing is conducted for the sponsored personnel from the cotton trade and industry, while at the GTC, theoretical and practical training is imparted on the different aspects of ginning and maintenance of ginning machines. A hostel that can accommodate about 20 trainees has also been provided at GTC.

Supply of reliable and accurate data on the quality of cotton fibre, yarn, fabrics, consultancy services and publication of research results for the benefit of appropriate user groups have been important activities of CIRCOT.

Technical Queries : Many queries from private organisations, semi government, state and central government departments were replied to. Information on various technologies and devices developed by CIRCOT, instruments designed, methods of test for cotton fibre, yarn and fabric quality levels of different cotton varieties, information on by-products and agro-waste utilisation, etc. were supplied to on several occasions.

Paid Tests : CIRCOT Test House has been receiving a fairly large number of samples of fibre, yarn, fabric as well as samples for various miscellaneous tests from textile mills, Government and Semi-Government organisations, as well as trade and industry on payment of prescribed test fees. The number of samples tested during 1998-99 as well as 1997-98 besides the average per annum for the quinquennium 1990-91 to 1994-

TABLE 15 : TYPES OF PAID TESTS AND THE NUMBER OF SAMPLES TESTED DURING 1998-99

Type of Tests	Average per annum for quinquennium 1990-91 to 1994-95	1995-96	1996-97	1997-98	1998-99
Fibre	1460	997	1839	4226	9353
Spinning	108	221	201	29	114
Yarn	287	207	309	180	156
Fabric	237	235	525	480	885
Ginning	21	205	96	286	259
Trash Content	-	232	195	286	1237
Miscellaneous	81	78	72	229	320
Total	2194	2175	3237	5716	12324

95 have been given in Table 15. Clientele of CIRCOT included :

- ✡ Brihanmumbai Municipal Corporation
- ✡ Nair Hospital, Mumbai
- ✡ Mumbai Port Trust
- ✡ Central Prisons of Pune, Aurangabad, Nasik and Nagpur
- ✡ Government Printing Press of Maharashtra, Mumbai
- ✡ Directorate of Quality Assurance, Mumbai
- ✡ RITES, Mumbai
- ✡ Rural Development and Water Conservation Department of the Govt. of Maharashtra, Mumbai

Besides routine tests, several special tests were also carried out on samples received from various organisations against payment of prescribed test fees. Some of these tests are outlined below :

1. Over 400 lime stone samples received from M/s. ACC, Thane for *XRD analysis*.
2. Forty-seven pigment and pharmaceutical drug samples received from ICI, Thane for *XRD analysis*.
3. Three pigment samples received from ICI Research Centre, Thane for *XRD analysis*.
4. Fifteen samples of liquid received from ICI Surfactants, Thane for determining the *Degree of Polymerisation*.
5. Five samples of Polymer films received from M/s. Reliance Industries Ltd., Thane for *XRD analysis*.
6. Twelve samples of Polymer chips and liquid received from M/s. Reliance Industries Ltd., Thane for *XRFS analysis*.
7. Three samples of Polymer received from M/s. Reliance Industries Ltd., Thane for *SEM photographs and analysis*.
8. Seventeen samples of pharmaceutical drug received from M/s. ICPA Laboratory, Mumbai for *XRD analysis*.
9. Two hundred and fifty-three samples of pharmaceutical drug intermediates received from M/s. IPCA Laboratory, Ratlam for *XRD analysis*.
10. Fifty-five samples of pharmaceutical drug intermediates received from M/s. EXON Laboratory, Mahad for *XRFS analysis*.
11. Twenty-one samples of PHPA received from M/s. S.P. Consultants, Mumbai for *XRD analysis*.
12. Three samples of silver activated carbon received from M/s. S.P.

Consultant, Mumbai for *XRFS analysis*.

13. Six samples of polymer received from Shri T.C. Rajagopalan, Mumbai for *SEM photographs and analysis*.

14. Ten samples of silver activated carbon and palladium activated carbon received from M/s. Advance Agrotech, Thane for *XRFS analysis*.

15. Fourteen samples of pharmaceutical drug pigment and polymer films received from UDCT, Mumbai for *XRD analysis*.

16. Thirty-six samples of polymer films received from UDCT, Mumbai for *SEM photographs and analysis*.

17. Seven samples of enzyme received from M/s. Associated Products, Mumbai for *Limiting Oxygen Index (LOX)*.

18. Twelve samples of pharmaceutical drug received from M/s. Kopran Ltd., Thane for *XRD analysis*.

19. Fourteen samples of pulp and liquid received from M/s. Siddhartha Chemicals, Vasco-da-Gama, Goa for *Antibacterial activity*.

20. Thirty samples of fabric from M/s. Jaysynth Dyechem Ltd., Mumbai for *Dyeing test*.

21. Eleven liquid samples received from M/s. Sriram Rayon, Kota for *Antibacterial test*.

22. One sample from Ramkrishna Bajaj CFBP Consumer Education Centre, Mumbai for *XRFS analysis*.

23. One sample of deodorant received from M/s. Amit Spinning Industries Ltd., Mumbai for *XRD analysis*.

24. One sample from M/s. 20 Micron Ltd., Baroda for *SEM photograph and analysis*.

25. Twelve samples of pharmaceutical drug received from M/s. Bombay College of Pharmacy, Mumbai for *XRD analysis*.

26. One sample of talcum powder received from M/s. Deep Raj Minerals, Mumbai for *XRD analysis*.

27. Forty samples of computer papers received from BMC, Mumbai for *Quality tests*.

28. Two samples from M/s. Pruthvi Technotex Services, Ichalkaranji for *Dyeing test*.

6

Publications

A. Annual Report

Annual Report of the Central Institute for Research on Cotton Technology for the year 1997-98.

B. Research Publications (CIRCOT Publications - New Series)

566. Nachane, R.P. and Hussain, G.F.S. – *Inverse Creep in Some Textile Yarns* (Published in the Indian Journal of Fibre and Textile Research, Vol. 23, No. 2, p.81, 1998).

567. Paralikar, K.M., Balasubramanya, R.H., Vizia, N.C., and Krishna Iyer, K.R.– *Variation in the Size of Fibre Base in Diploid and Tetraploid Cotton Varieties in Relation to the Strength of Attachment and Seed Coat Removal* (Published in The Indian Journal of Fibre and Textile Research Journal, Vol. 23, No. 2, p.67, 1998).

568. Iyer, K.R.K. – *Desi Cottons : Time for Revival ?* (Published in The Indian Textile Journal, Vol. 108, No. 12, p.48, 1998).

569. Iyer, J.K., Bhama Iyer., P. and Rajagopal, K.B. – *Measurement of Cotton Fibre Length* (Published in The Indian Textile Journal, Vol. 108, No.12, p.60, 1998).

570. Nachane, R.P., and Mahindrakar, S., – *Upholstery Fabrics and Dust* (Published in The Indian Textile Journal, Vol. 108, No. 11, p. 20, August, 1998).

571. Bhatawdekar, S.P., Balasubramanya, R.H., and Inamdar, A.N. – *Characterization of Cottonseed Protein Oil* (Published in the Journal of the Indian Society for Cotton Improvement, Vol. 23, No. 2, p. 201, 1998).

572. Subrahmanyam, Y., Kumar, V., Pai, S.D., Nagwekar, S.N. and Ukidve, A.V. – *Cotton Fibre Development in Intra-hirsutum Hybrids and their Parents* (Published in the Journal of the Indian Society for Cotton Improvement, Vol. 23, No.2, p.207, September, 1998).

573. Deshmukh, L.D., Ansingkar, A.S., Itagi, S.V. and Ukidve, A.V. – *Effect*

of Induced Mutations on Fibre Properties of Asiatic Cotton (Published in the Journal of the Indian Society for Cotton Improvement, Vol. 23, No.2, p. 213, 1998).

574. Talukdar, M.K., Deb Roy M., Ghosh, S.K. and Mhadgut, D.V. – *Influence of Fibre Cross-section and Processing Parameters on Bending Length of Non-woven Needle-punched Fabrics* (Published in the Indian Journal of Fibre & Textile Research, Vol. 23, No.3, p. 147, 1998).

575. Hussain, G.F.S. and Nachane, R.P. – *Friction in Cotton Fibres* (Published in The Indian Textile Journal, Vol. 109, No. 2, p.22, 1998).

576. Paralikar, K.M., and Raje, C.R. – *Improving Cotton Fabric - Surface Modification Additives* (Published in The Indian Textile Journal, Vol. 109, No.2, p. 22, 1998).

577. Iyer, V., Varadarajan, P.V., Chattopadhyay, S.K., Chhagani, R.R. – *Differential Dyeing Behavior of Polyester/Cotton Blended Ring and Rotor Spun Yarns* (Published in Colourage, Vol. XLV, No. 12, p. 19, December 1998).

578. Nachane, R.P., Hussain, G.F.S. and Iyer, K.R.K. – *Theory of Stick Slip Effect* (Published in the Indian Journal of Fibre & Textile Research, Vol. 23, p. 201, December 1998).

579. Raje, C.R., Gurjar, R.M., Nagarkar, R.D. and Kawlekar, S.R. – *Effect of Processing Conditions on the Dyeing of Knitted Cotton Fabrics* (Published in the Asian Textile Journal, Vol. 8, No.2, p. 46, 1999).

580. Pai, S.D., Ukidve, A.V., Raje, C.R. and Bhaskar, P. – *Properties of Chemically Treated Fabrics* (Published in The Indian Textile Journal, Vol. 109, No.6, p.32, March 1999).

581. Varadarajan, P.V. and Nayana D. Nachane – *Pretreatment to Improve Cotton Fabric* (Published in the Indian Textile Journal, Vol. 109, No. 4, p. 60, January, 1999).

582. Balasubramanya, R.H., Bhatawadekar, S.P.– *Utilisation of Agricultural Waste as Feed for Ruminants* (Published in the Journal of Microbiology, Vol. 21, No. 1, p. 14, 1981).

583. Bhatawdekar, S.P. and Balasubramanya, R.H. – *Enrichment of Cattlefeed with Microbial Protein* (Published in the Indian Journal of Microbiology, Vol. 23, No. 2, p.76, 1983).

584. Paralikar, K.M. and Bhatawdekar, S.P. – *Scanning Electron Microscopy Study of Enzyme and Acid Hydrolysed Cotton Fibres* (Published in the Cellulose Chemistry and Technology, Vol. 18, No. 6, p. 607, 1984).

585. Bhatawdekar, S.P. – *Enrichment of Cottonseed Hulls as Cattle Feed* (Published in the Newsletter of AICOSCA, No. 11, p. 79, 1981).

586. Bhatawdekar, S.P., Sreenivasan, S., Balasubramanya, R.H. and Paralikar, K.M. – *Effect of Alkali Treatment on the Enzymolysis of Never Dried Cotton Cellulose* (Published in the Textile Research Journal, Vol. 62, No. 5, p.290, 1992).

587. Bhatawdekar, S.P., Kathe, A.A., Balasubramanya, R.H. and Khandeparkar, V.G. – *Preparation of Protein Hydrolysates (Peptones) from Cottonseed Meal* (Published in the Newsletter of AICOSCA, No. 2, p. 6, 1993).

588. Shastry, P.P., Mishra, V.S., Bhatawdekar, S.P. and Mandloi, K.C. – *Aminoacid Pattern and Involvement of Ethylene in the New Wilt of Cotton* (Published in the Annals of Plant Physiology, Vol. 8, p. 6, 1994).

589. Bhatawdekar, S.P., Balasubramanya, R.H., Khandeparkar, V.G. Singh, V.V. and Narayanan, S.S. – *Characterisation of Cottonseed Proteins in Selected Germplasm of Diploid Cultivated Cottons* (Published in the Journal of Indian Society fo r Cotton Improvement, Vol. 19, No.1, p. 93, March 1994).

590. Singh, V.V. Narayanan, S.S. Bhatawdekar, S.P., Balasubramanya, R.H. and Khandeparkar, V.G. – *Evaluation of Selected Germplasm of Tetraploid Cultivated Cottons (Gossypium species) for amino Acid Profile* (Published in the Indian Journal of Agricultural Sciences, Vol 65, No. 1, p. 24, January 1995).

591. Nachane, R.P. and Hussain, G.F.S., Pai, S.D. and Mhadgut, D.V. – *Relationship between the Cotton Yarn Price and Fibre Properties : Part I* (Published in The Textile Industry and Trade Journal, Vol.36, No.11-12, p.80 (1998).

592. Nachane, R.P. and Hussain, G.F.S., Pai, S.D. and Mhadgut, D.V. – *Relationship between the Cotton Yarn Price and Fibre Properties : Part II* (Published in The Textile Industry and Trade Journal, Vol.36, No.1-2, p.37 (1999).

C. Other Publications

1. *Annual Cotton Quality Update 1998.*
2. *Schedule of Test Fees.*
3. *Technological Report on Trade Varieties and Standard Cottons for 1996-97 Season.*
4. *Technological Research at CIRCOT since Independence.*
5. CIRCOT Leaflet No. 9 – *CIRCOT Calibration Cottons for Conventional Fibre Testing Equipment and HVI System.*
6. CIRCOT Leaflet No. 10 – *Special Training Course on the Use of Uster HVI and AFIS.*
7. CIRCOT Leaflet No. 11 – *Technical Consultacy for Ginning Units.*
8. CIRCOT Leaflet No. 12 – *Paper Grade Pulp from Cotton Stalks by a Biological Route.*
9. CIRCOT Leaflet No. 13 – *A Novel Pre-treatment to Cellulosic Substrates for Seeding Oyster Mushrooms.*
10. CIRCOT News – First Issue (April to September 1998).
11. *Book of Papers of the Half-a-day Seminar on How to Improve Quality of Indian Textiles to Meet International Standards ?.*

D Papers presented at Seminar/ Conference, etc.

1. Vizia, N.C., and Anap, G.R. – *Ginning - Scenario Beyond 2000 AD* (Presented at the National Seminar on the Scenario of Cotton and Blended Textiles beyond 2000 AD held during April 24-25, 1998 at Mumbai).
2. Krishna Iyer, K.R. – *Cotton Quality for Twenty-first Century* (Presented at the National Seminar on the Scenario of Cotton Blended Textiles beyond 2000 AD held during April 24 - 25, 1998 at Mumbai).
3. Pandey, S.N. and Tiwari, S. – *Energy Saving Cost Effective & Ecofriendly Textile Processing* (Presented at the National Seminar on the Scenario of Cotton Blended Textiles beyond 2000 AD held during April 24-25, 1998 at Mumbai).
4. Krishna Iyer, K.R. – *Present Status and Future Strategies for Improving Quality of Cotton for its Competitiveness with other Fibres* (Presented at the National Seminar on Strategies for Improvement of Production, Productivity and Quality of Cotton held during May 4-5, 1998 at Mumbai).

5. Ganesan, S., and Nema, B.P. – *Design and Development of a Fuel Efficient Sigri* (Presented at the 33rd Annual Convention of I.S.A.E., during September 21-23, 1998 at CIAE, Bhopal).

6. Balasubramanya, R.H. and Gangar, H.U. – *Semi-continuous Biogas Plant for the Production of Methane from Willow-dust* (Presented at the 13th National Convention of Textile Engineers held during October, 3-4, 1998 at Solapur).

7. Bhama Iyer, P., Rajagopal, K.B. and Ananthakrishnan, K.V. – *Assessment of Fibre Maturity by AFIS* (Presented at the 13th National Convention of Textile Engineers held during October, 3-4, 1998 at Solapur).

8. Nachane, R.P. and Hussain, G.F.S. – *Fibre Properties and Friction in Textile Fibres* (Presented at the 13th National Convention of Textile Engineers held during October 3-4, 1998 at Solapur).

9. Krishna Iyer, K.R. – *Cotton Scenario in India* (Presented at the Seminar entitled *Indian Petrochemicals Market - the Next Decade* held during October 15 - 16, 1998 at Mumbai).

10. Gayal, S.G. and Khandeparkar, V.G. – *Production of Carbohydrates by Pencillium funiculosum Suitable for Release of Intercellular Plant Material* (Presented at the IFCON'98 Fourth International Food Convention : *Trends in Food Science and Technology - Global Perspective* held during November, 24-27, 1998 at Mysore).

11. Shaikh, A.J. and Varadarajan P.V. – *Corrugated Boxes from Cotton Plant Stalks for Packaging, Transportation and Storage of Fruits* (Presented at the IFCON'98 Fourth International Food Convention : *Trends in Food Science and Technology - Global Perspective* held during November 24-27, 1998 at Mysore).

12. Balasubramanya, R.H. – *An Inexpensive Pre-treatment of Cellulosic Material for Growing Edible Oyster Mushrooms* (Presented at the IFCON'98 Fourth International Food Convention : *Trends in Food Science and Technology - Global Perspective* held during November 24-27, 1998 at Mysore.).

13. Sawant, S., Balasubramanya, R.H., Paralikar, K.M. and Singh, V.V. – *Occurrence of Gram-negative Bacteria in Never-dried Cotton Bolls* (Presented at the 39th Annual Conference of the AMI held during December 5-6, 1998 at Mangalore).

14. Gayal, S.G. and Shaikh, A.J. – *Deinking of Newspaper Waste Using Cellulose for Recycling Purpose* (Presented at the 39th Annual Conference of the AMI held during December 5-6, 1998 at Mangalore).

15. Bhatawdekar, S.P., Balasubramanya, R.H. and Kathe, A.A. – *Cottonseed Meal Peptones for Microbial Identification* (Presented at the 39th Annual Conference of the AMI held during December 5-6, 1998 at Mangalore).

16. Shaikh, A.J. and Balasubramanya, R.H. – *Preparation of Pulp and Paper from Tendu Leaf Cuttings* (Presented at the 39th Annual Conference of AMI, during December 5-6, 1998 at Mangalore).

17. Bhama Iyer, P., Janaki Iyer, K., and Sreenivasan, S. – *Application of AFIS in Fibre Quality Evaluation : An Overview* (Presented at the Joint Technological Conference of ATIRA, BTRA, NITRA, and SITRA held on March 7&8, 1999 at Coimbatore).

18. Nachane, R.P., Ukidve, A.V. and Bhama Iyer, P. – *Reference Material for Cotton Testing* (Presented at the Second National Workshop on Development and Use of Reference Materials (DUREM - 2) Organised by Central Pollution Control Board, Delhi during February 10 - 12, 1999 at New Delhi).

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List of On-Going Projects During 1998-99

CORE AREA I : IMPROVEMENT IN GINNING OF COTTON

Time Bound Research Projects:

Effect of Pre-cleaning, Ginning and Post-cleaning on Lint and Yarn Quality of different Varieties of Cotton.

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

Continuous on-going Institutional Projects:

1. Evaluation of the Quality of Cotton Samples Received from Research Stations under the All India Co-ordinated Cotton Improvement Project and other Research Projects Financed by ICAR, State Governments, etc.
2. Evaluation of Quality of Major Trade Varieties Grown in different Parts of the Country.
3. Evaluation of Quality of Standard Varieties of Indian Cotton.

Time Bound Research Projects

1. The Effect on Fibre Qualities and Yield Levels of Cottons due to Application of Neem Products.
2. Improving Fibre Properties and Yield Potential of *arboreum* Cottons by Unconventional Breeding Methods .
3. Application of Advanced Fibre Information System (AFIS) for Measuring Maturity and Fineness of different Varieties of Cotton.
4. Effect of Agroclimatic Conditions and Agricultural Practices on the Short Fibre Content of Popular Hybrids Grown in the Gujarat State.
5. Fibre Quality Studies of Newly Developed Strains/Hybrids under Specially Initiated Breeding Programme for Improvement in Fibre Tenacity and Extensibility.
6. Design Modifications on Pneumatic Splicer for Improved Splicing Action.
7. Morphology of Cotton Seed Surface in Relation to Fibre Development and Seed Coat Removal.

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

Time Bound Research Projects

1. Alkaline Treatment of Polyester Fabrics.
2. Synthesis of Eco-friendly Azo Dyes.
3. Isolation, Characterisation and Application of Natural Dyes.
4. Effect of Enzymatic Treatments on Properties of Woven Fabrics.
5. Production of Cellulase and Amylase by Solid State Fermentation.

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

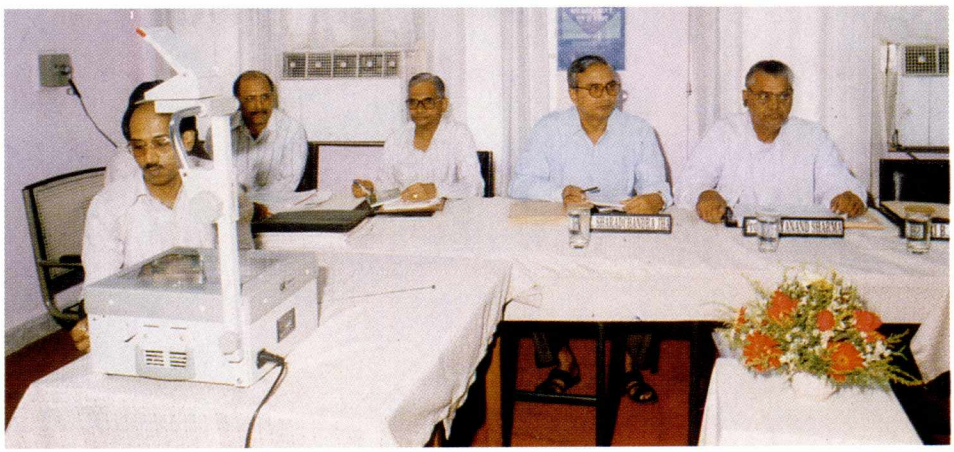
Time Bound Research Projects

1. Enrichment of Cellulosic Materials with Microbial Proteins for Improved Digestibility.
2. Microbial Retting of Bast Fibres for Textile Purposes.
3. Scale-up Studies on the Preparation of Microcrystalline Cellulose from Sisal Fibres.

Externally Aided Projects

1. Operational Research Project on the Preparation of Paper Grade Pulp from Cotton Plant Stalks by Anaerobic Digestion.
2. Objective Analysis of Fabric Quality - Handle, Comfort and Durability Parameters of Apparel Fabrics.
3. Utilisation of Cotton Plant Stalks and other Crop Residues for Making Pulp and Paper through Anaerobic Digestion.
4. Preparation and Marketing of CIRCOT Calibration Cotton.
5. Effect of Yarn Structure on the Dyeing Behaviour of Cotton and Polyester Blended Yarns/Fabrics.
6. Processing of Cotton-Ramie Blends on Short Staple Spinning Systems.
7. Estimation of Fibre Maturity from Micronaire Value.

RESEARCH ADVISORY COMMITTEE MEETING



RAC in Session

MANAGEMENT COMMITTEE MEETING

Management Committee in Session

QRT Report

8

SRC, RAC, Management Committee and QRT

Staff Research Council

The ninety-eighth meeting of the Staff Research Council (SRC) was held on June 19 and 20, 1998. Progress of research work during April 1, 1997 to March 31, 1998 and new project proposals for 1998-99 were discussed and a new programme of work for 1998-99 was finalised.

The SRC approved 13 new research project proposals of which one was in Core Area I, four in Core Area II, five in Core Area III and three in Core Area IV for the year 1998-99.

Research Advisory Committee

The fourth meeting of the Research Advisory Committee (RAC) was held on July 9 and 10, 1998 mainly to give directives for research and framing of policies if any, thereof. There were discussions on the on-going research projects, as recommended by the SRC as well as on new research project proposals for 1998-99. The relevance of each of the projects with respect to the mandate of the Institute also was considered. On the second day a lecture on **Reminiscences of Sir C.V. Raman** by Dr. T. Radhakrishnan, Chairman, RAC was organised. All the RAC members, scientists and technical personnel attended the lecture.

Management Committee

The Forty-seventh and Forty-eighth Meetings of the Management Committee were held on August 13, 1998 and February 12, 1999 respectively. Regular items such as confirmation of the minutes of the previous meeting, action taken on the recommendations of the committee, progress of works, action taken on the recommendations of the Institute Joint Council and Grievance Committee formed the topics of discussion in all the meetings. Discussions on the on-going research projects and research highlights were also included in the deliberations. One of the important items in the agenda was to organise a seminar during December 1999 to mark the Institute's completion of 75 years in 1999.

Quinquennial Review Team (QRT)

During the year the report of the QRT for the eleven year period from 1986 to 1996 was finalised. Dr. Jaiprakash, Chairman, Quinquennial Review Team (QRT) submitted the Final Report to Dr. A. Alam, DDG, ICAR in the presence of Dr. R.P. Kachru, ADG (PE), ICAR and Dr. K.R. Krishna Iyer.

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Participation of Scientists in Conferences, Meetings, Workshops, Symposia, etc.

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

Sl. No.	Meetings/Conferences/Seminars/ Symposia, etc.	Place	Date	Name of the person who attended
1.	*National Seminar on the Scenario of Cotton & Blended Textiles Beyond 2000 AD.*	Mumbai	24-04-1998 & 25-04-1998	All Scientific and Technical Personnel
2.	*National Seminar on Strategies for Improvement of Production, Productivity and Quality of Cotton.*	Mumbai	04-05-1998 & 05-05-1998	Scientists of CIRCOT
3.	*Seminar on Photography.*	Mumbai	20-07-1998	Shri R.M. Modi
4.	*Seminar on Utilisation of Non-wood Fibrous Raw Materials for Paper Manufacture in Small & Large Paper Mills.*	Chandigarh	24-07-1998 & 25-07-1998	Shri A.J. Shaikh
5.	*33rd Annual Convention of I.S.A.E.*	Bhopal	21-09-1998 to 23-09-1998	Shri B. P. Nema
6.	*International Seminar on Indian Petrochemicals Markets - the Next Decade.*	Mumbai	15-10-1998 16-10-1998	Dr. K.R. Krishna Iyer
7.	*13th National Convention of Textile Engineers.*	Solapur	03-10-1998 & 04-10-1998	Dr. R.H. Balasubramanya Dr. (Smt.) P. Bhama Iyer Dr. R.P. Nachane Dr. G.F.S. Hussain Shri H.U. Gangar Shri K.B. Rajagopal

PARTICIPATION OF SCIENTISTS IN CONFERENCES

Sl. No.	Meetings/Conferences/Seminars/ Symposia, etc.	Place	Date	Name of the person who attended
8.	*DAE - BRNS Workshop on Applications of Image Processing in Plant Sciences & Agriculture.*	Mumbai	26-10-1998 to 30-10-1998	Shri M.V. Vivekanandan
9.	*54th All India Textile Conference and Textile Exhibition.*	Ahmedabad	15-11-1998 & 16-11-1998	Dr. R.H. Balasubramanya Dr. R.P. Nachane
10.	*IFCON'98 IV International Food Convention : Trends in Food Science & Technology - Global Perspective.*	Mysore	24-11-1998 to 27-11-1998	Dr. S.G. Gayal Dr. R.H. Balasubramanya Shri A.J. Shaikh
11.	*39th Annual Conference of the Association of Microbiologists of India.*	Mangalore	05-12-1998 & 06-12-1998	Dr. R.H. Balasubramanya Dr. S.G. Gayal Dr. (Smt.) S.P. Bhatawadekar Shri A.J. Shaikh
12.	*Seminar on Cost and Quality in the Changed Scenario due to Globalisation.*	Mumbai	11-12-1998 & 12-12-1998	Dr. R.H. Balasubramanya Dr. K.M. Paralikar Shri A.J. Shaikh Shri R.M. Gurjar Dr. S.G. Gayal
13.	*16th Annual IIPC Workshop and Conference on Photography Today.*	Mumbai	26-12-1998 to 30-12-1998	Shri R.M. Modi
14.	*Second National Workshop on Development and Use of Reference Material, DUREM - 2.*	Delhi	10-02-1999 to 12-02-1998	Dr. A.V. Ukidve Dr. R.P. Nachane Shri M.V. Vivekanandan
15.	*Two Day Seminar on Environmental Management System : ISO 14000.*	Mumbai	11-02-1999 & 12-02-1999	Dr. P.V. Varadarajan
16.	*Two Day Seminar on Blowroom & Carding.*	Mumbai	13-02-1999 & 14-02-1999	Shri N. Shanmugam
17.	*National Seminar on Recent Trends in Physics and Astrophysics.*	Nanded	14-02-1999	Dr. L.D. Deshmukh
18.	*Seminar on How to improve Quality of Indian Textiles to Meet International Standards?.*	Mumbai	20-02-1999	All Scientific and Technical Personnel
19.	*Two-day Joint Technological Conference of ATIRA, BTRA, NITRA, and SITRA.*	Coimbatore	07-03-1999 & 08-03-1999	Dr. (Smt.) P. Bhama Iyer Dr. S. Sreenivasan Shri S. Venkatakrishnan

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Workshops, Seminars, Summer Institutes, Farmers' Day, etc. Organised at the Institute

National Seminar on the Scenario of Cotton and Blended Textiles Beyond 2000 AD

A two-day National Seminar on ***The Scenario of Cotton and Blended Textiles beyond 2000 AD*** was organised by CIRCOT in collaboration with the Indian Fibre Society at the Centrum Hall, World Trade Centre, Mumbai on April 24 and 25, 1998. The Seminar, organised as part of the Golden Jubilee celebration of India's Independence was inaugurated by Mr. B. C. Khatua, Textile Commissioner in the august presence of dignitaries including Dr. Anwar Alam, DDG (Engg.), ICAR, Mr. M. B. Lal, CMD of CCI, Mr. D. R. Mehta, CMD of NTC (MN), Mr. Suresh Kotak, President of EICA and Dr. R. P. Kachru, ADG (PE), ICAR. The Inaugural session was presided over by Dr. Anwar Alam, DDG (Engg.), ICAR.

The technical presentations that followed the inaugural session were covered in six sessions as follows, spread over two days.

Technical Session I : Fibre Production and Quality

Technical Session II : Fibre Production and Quality

Technical Session III : Yarn Production and Quality

Technical Session IV : Fabric and Garment -Production and Quality

Technical Session V : Chemical Processing

Technical Session IV : Marketing and Human Resource Development.

Workshop on Ecofriendly Cotton

Indian Society for Cotton Improvement (ISCI) organised a one day ***Workshop on Ecofriendly Cotton*** on October 31, 1998 in association with CIRCOT.

The Workshop deliberated on the present status and issues concerning production, certification, marketing and

research and development of organic and naturally coloured cotton.

Dr. K.R. Krishna Iyer, Director welcomed the participants. Dr.A.K. Basu, Cotton Advisor, CCI, Mumbai elaborated the theme of the workshop. Dr. Anwar Alam, DDG, ICAR remarked that the long term effect of organic cotton cultivation on the economy of a country like India may not be positive. Shri M.B. Lal, CMD, CCI, Mumbai projected a bright future for organically grown and naturally coloured cotton. Other dignitaries like Shri N.S. Kulkarni, Retd. CMD, CCI, Mumbai and C.V. Radhakrishnan also expressed their views on the cultivation of ecofriendly cotton.

Deliberations were held in two sessions while the third session was devoted to summing up. The first session which focused on production, certification and marketing was moderated by Dr. A.K. Basu. The second session which dealt with R&D aspects was moderated by Dr. V. Sundaram, Retd. Director, CIRCOT who also summed up the proceedings. Dr. Sundaram highlighted the efforts made by ISCI in impressing upon the concerned agencies the need for a local certification body to certify cotton that is organically grown in several eco-regions of the country. This only will ensure remunerative price for growers of organic cotton who otherwise have to depend on foreign agencies causing drain of money and energy.

Special Training Course on the Use of HVI and AFIS

The first training course on the use of HVI and AFIS was organised by CIRCOT in collaboration with Zellweger Uster India (ZUI) in CIRCOT from November 30 to December 4, 1998. Earlier two Officers of this Institute were trained at their R&D and Training Centre for Fibre Testing at Knoxville in the trainer's training programme to ensure a training methodology that is in line with that followed in USA. Three mills deputed their staff from their quality assurance department for the above training. Three such special courses are planned in the current year, which would start after May 31, 1999.

CIRCOT-Ginners Meet

A joint meeting of ginners and CIRCOT was organised at Beed in Maharashtra on November 5, 1998. The meeting presided over by Dr. K. R. Krishna Iyer, Director CIRCOT, was attended by 80 ginners from different parts of Maharashtra State. Dr. Iyer in his introductory remarks presented the ginning scenario in the country and pointed out the deficiencies in the performance of the ginneries.

How to Improve Quality of Indian Textile to Meet International Standards ?

This Half-a-day seminar on was organised jointly by CIRCOT and Indian

Fibre Society (IFS) on February 20, 1999. This seminar is part of year long celebrations planned by the Institute which entered its 75th year of fruitful service to the cause of cotton production and quality.

Dr. K.R. Krishna Iyer, Director welcomed the participants and the seminar was inaugurated by Shri P.M. Nevatia, Sr. Vice President, The Century Textiles and Industries, who also chaired the session. He wished CIRCOT many more fruitful years of service to textile industry. In the years of recession that is plaguing the textile industry, the Chairman called upon the burecrates to work out ways to achieve consistency of quality and share their experience of success so that the quality of Indian Textile products would match with that of advanced countries irrespective of the source of origin.

The inaugural session was followed by two technical sessions in which four papers were presented - two on production of quality yarn and the other two on production of quality fabrics.

National Science Day

The National Science day was celebrated on the February 28, 1999 with a talk by Dr. K.S. Parthasarathy, Secretary, Atomic Energy Regulatory Board, Mumbai on **Radiological Impact of Radiation Installations on Man and the Environment**.

Exhibition

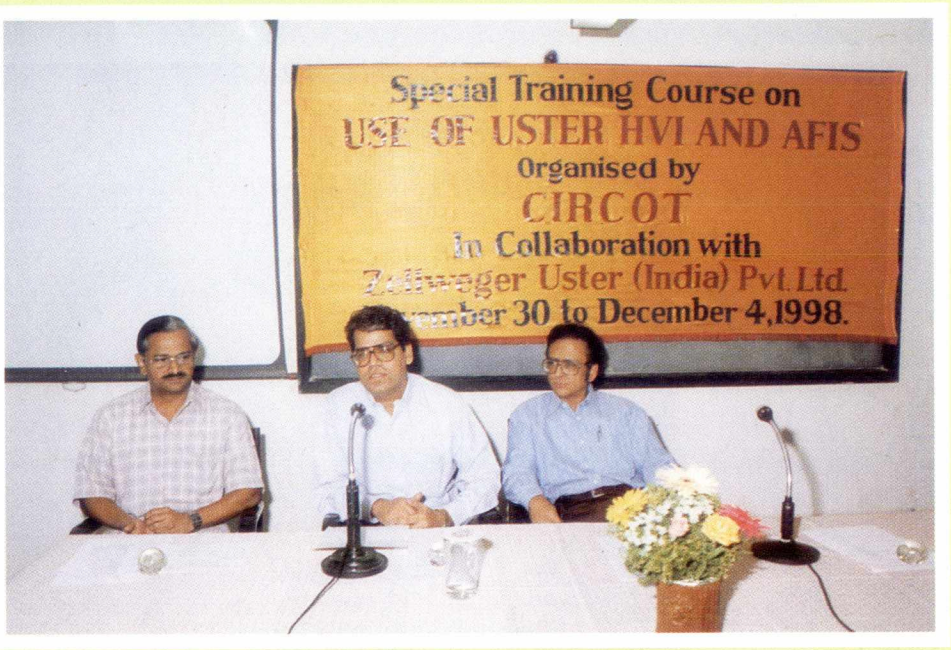
CIRCOT participated in the **Agro-Advantage 98.** Exhibition organised by the Government of Maharashtra during November 6-10, 1998. Various activities of CIRCOT were displayed through posters and models.

NATIONAL SEMINAR ON SCENARIO OF COTTON AND BLENDED TEXTILES BEYOND 2000 AD

Dr. Anwar Alam, DDG (Engg.), ICAR Lighting the Inaugural Lamp

Address by Dr. R.P. Kachru, ADG (PE), ICAR

SPECIAL TRAINING COURSE ON USE OF USTER HVI AND AFIS



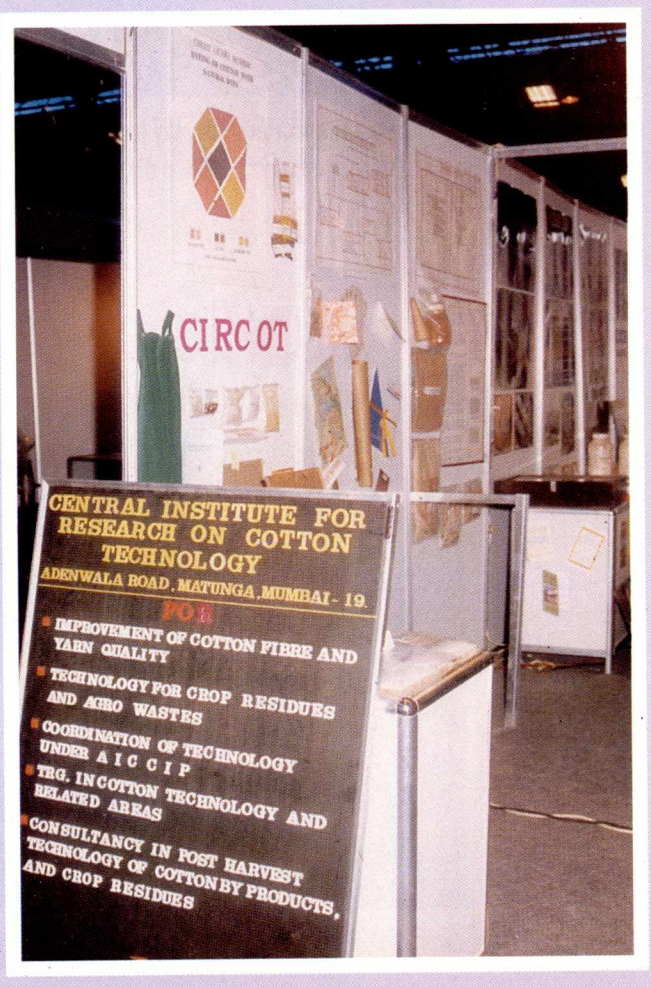
Inauguration of the Training Course by Shri V.R. Ratnam, President, Zellweger Uster (India) Pvt. Ltd. On the left is Dr. S. Sreenivasan, Head, QEID and on the right Dr. K.R. Krishna Iyer, Director, CIRCOT

Trainees with Course Faculty

CIRCOT - GINNERS MEET AT BEED (MS)

Presidential Address by Dr. K.R. Krishna Iyer, Director, CIRCOT

EXHIBITION



CIRCOT Stall at the Agro-Advantage 98 *Exhibition* ⇨

SEMINAR ON HOW TO IMPROVE QUALITY OF INDIAN TEXTILES TO MEET INTERNATIONAL STANDARDS

Inaugural Address by Shri P.M. Nevatia, Sr. Vice President, The Century Textiles and Industries, Mumbai

A Section of the Audience

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Distinguished Visitors

1. Dr. R.S. Paroda, Secretary, DARE, Director General, ICAR, New Delhi
2. Dr. Anwar Alam, DDG (Engg.) , ICAR, New Delhi
3. Dr. (Prof.) Gajendra Singh, DDG (Engg.), ICAR, New Delhi
4. Dr. R.P. Kachru, ADG (PE), ICAR, New Delhi
5. Dr. T. Radhakrishnan, Retd. Director, ATIRA, Ahmedabad, & Chairman, RAC
6. Prof. Karyanand Sharma, Progressive Farmer & Professor, M.V.S. Chandona College, Bihar & Nominated to RAC as Member by ICAR, New Delhi
7. Prof. Sharadchandra Jha, Progressive Farmer & Professor, K.V. Science College, Bihar & Nominated to RAC as Member by ICAR, New Delhi
8. Prof. K.R. Salhotra, Head, Department of Textile Technology, IIT, New Delhi & Member, RAC
9. Dr. S. S. Narayanan, Retd. Director, CICR, Nagpur & presently Cotton Breeder, Nagarjuna Agricultural Research and Development Institute, Secunderabad & Member, RAC
10. Shri B.A. Patel, Joint Textile Commissioner, Mumbai & Member, RAC
11. Prof. V. Subramaniam, Department of Textile Physics, A.C. College of Technology, Anna University, Chennai & Member, RAC
12. Shri S.C. Grover, Director (P & M), the Cotton Corporation of India, Mumbai & Member, RAC
13. Dr. Jaiprakash, Advisor, Northern India Textile Research Association (NITRA) & Chairman, QRT
14. Dr. R.B. Patil, Retd. Director, Institute for Post Graduate Studies, University of Agricultural Sciences, Dharwad, Karnataka & Member, QRT
15. Dr. (Smt.) Pushpa Bajaj, Professor, Textile Technology, IIT, New Delhi & Member, QRT
16. Dr. N.E. Dweltz, Retd. Deputy Director, ATIRA, Ahmedabad & Member, QRT

17. Dr. S.R. Vengsarkar, Chief Executive Officer, Zenith Fibres, Baroda & Member, QRT
18. Dr. M.S. Kairon, Director, CICR, Nagpur
19. Shri Anil Kumar Joshi, Dy. Director (Official Language), ICAR, New Delhi
20. Shri Dilip Tiwari, Programme Director, Doordarshan, Mumbai
21. Shri Suresh Prasad Choubey, Dy. Director (Official Language), Directorate General of Shipping
22. Shri Girija Shankar Trivedi, Chief Editor, Navneet, Mumbai
23. Shri Umakant Vajpayee, Director, ASHIRWAD, Mumbai
24. Prof. Vilas M. Patil, Anuradha Engineering College, Buldana, Maharashtra
25. Prof. A.K. Talukdar, Anuradha Engineering College, Buldana, Maharashtra
26. Dr. S. Lingaraju, Associate Professor, University of Agricultural Sciences, Dharwad, Karnataka
27. Dr. N.N. Karnool, Associate Professor, University of Agricultural Sciences, Dharwad, Karnataka
28. Dr. S.S. Angadi, Associate Professor, University of Agricultural Sciences, Dharwad, Karnataka
29. Shri Arya, IAS, Jt. Secretary, Govt. of India, Ministry of Agriculture, New Delhi
30. Dr. K.S. Parthasarathy, Secretary, Atomic Energy Regulatory Board, Mumbai
31. Dr. R.C. Maheshwari, Assistant Director General (CSC), ICAR, New Delhi

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Infrastructural Facilities

Library

To keep pace with the advancements in the field of cotton research, latest available books on cotton, cotton technology, agro-waste utilisation and books of general research interest were periodically being added to the library. During 1998-99, 40 books were added to the library and the total number of books by the end of March 1999 was 5061. With the addition of 100 bound volumes of journals, the total number of bound volumes stands at 6648. Ninety journals were obtained through subscription. Many journals were also received by way as complimentary or on exchange basis. During the period Rs.7 lakh worth of books and periodicals were added to the library. Besides the staff of this Institute, the library facilities were availed of by the students and researchers from various colleges affiliated to Mumbai university, sister institutions and personnel from the textile industry. Inter-library loan facilities were also maintained with other libraries in Mumbai.

List of Major Equipments Procured

- Autoclave - Equitron Make
- pH Meter - Chemin Make
- Nep Module of AFIS
- Digital Fibrograph Model 730
- Electronic Twist Tester
- Software for Lea Multitester
- Projection Microscope
- Atomic Absorption Spectrometer with Flame, Graph, Furnace, Hydride generator and Mercury Concentrator
- Elga make Water Purification System
- High Performance Liquid Chromatography with Diode Aray Detector
- Total Organic Carbon Analyser
- Environmental Chamber
- Laboratory Model Incubator
- Laboratory Jigger
- Perspirometer
- Sample preparation for Perspirometer

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Personnel

Major events during 1998-99 relating to CIRCOT personnel are listed below :

A. APPOINTMENT

Sl. No.	Name	Designation	Effective date of appointment
		Scientific Staff	
1.	Shri V.G. Arude	Scientist	21-05-1998
2.	Dr. R. Murugesan	Scientist	21-10-1998
		Administrative Staff	
1.	Shri Devesh Nigam	Accounts Officer	15-03-1999

B. PROMOTION

Technical Staff

The Assessment of technical officers was held and promotion to eligible staff granted as indicated below :

Sl. No.	Name	Grade to which promoted	Effective date of promotion
1.	Shri B.S. Ganvir	T - 7	01-07-1997
2.	Smt. S.V. Nayar	T - 6	01-07-1996
3.	Shri M.C. Bhalod	T - 6	01-07-1997
4.	Shri V.B. Suryanarayanan	T - 6	01-01-1998

The five yearly assessment of eligible technical staff was held and promotions/advance increments granted to the following technical personnel:

Sl. No.	Name	Grade to which promoted	Effective date of promotion
		Through Assessment	
1.	Shri. R.D. Nagarkar	T - 5	01-07-1998
2.	Shri M.V. Vivekanandan	T - 5	01-01-1998
3.	Smt. Bindu Venugopal	T - 4	01-01-1998
4.	Shri R.G. Dhakate	T - 4	01-01-1998
5.	Shri S.N. Hedau	T - 4	01-07-1997
6.	Smt. K.K. Kale	T - 4	01-01-1998
7.	Shri D.U. Kamble	T - 4	01-07-1997
8.	Smt. S.R. Kawlekar	T - 4	01-07-1997
9.	Shri S.S. Patekar	T - 4	01-01-1994
10.	Shri D.B. Gadankush	T-II-3	01-01-1995
11.	Shri S.G. Shinde	T-II-3	01-01-1995
12.	Shri K.V. Nair	T-1-3	01-01-1990
13.	Shri B.V. Shirsat	T-2	01-01-1997
14.	Shri M.Y. Chandanshive	T-1	17-12-1995
15.	Shri S.M. Sawant	T-1	17-12-1995
16.	Shri Gian Singh	T-1	25-09-1998
17.	Shri John Robert	T-1	05-11-1998
		Administrative Staff	
1.	Smt. S.G. Parab	Jr. Stenographer	02-12-1997
2.	Shri S.N. Bandre	Jr. Clerk (Temporary Vacancy)	10-12-1998
		Supporting Staff	
1.	Shri V.M. Subramanaiam	SS.Gr. IV	13-05-1998
2.	Shri L.R. Indurkar	SS.Gr. IV	10-12-1998
3.	Shri M.K. Ghadge	SS.Gr. III	13-05-1998
4.	Shri H.B. Vesmiya	SS.Gr. III	13-05-1998
5.	Shri R.S. Rane	SS.Gr. III	30-06-1996*
6.	Shri G.N. Mayavanshi	SS.Gr. II	30-06-1996*
7.	Shri Hari Singh Bhabar	SS. Gr. IV	29-06-1996
8.	Shri S. D. Gurav	SS. Gr. III	29-06-1996

Sl. No.	Name	No. of Advance Increments	Effective date of increment
		Advance Increments	
1.	Shri I.H. Hunsikatti	One (Total 3)	01-07-1997
2.	Shri P.K. Mandhyan	Three	01-07-1997
3.	Shri S. Venkatakrishnan	Three	01-01-1998
4.	Shri D.L. Upadhye	Three	01-01-1998
5.	Shri Amar Pal	One	01-07-1997
6.	Smt. Sheela Raj	Three	01-01-1998
7.	Shri V.N. Bhorkar	One	01-07-1997
8.	Shri Nehrulal Meena	One	01-07-1997
9.	Smt. Subashri Kumar Subramaniam	One	01-01-1998
10.	Shri P.G. Kadam	Three	01-07-1997

C. UPGRADATION

1. Smt. M.V. Kamerkar, Assistant to the Post of Asstt.Administrative Officer w.e.f 23-10-1998.
2. Shri M.Z. Bhagat, Assistant to the Post of Asstt.Administrative Officer w.e.f 30-10-1998.
3. Shri Venu Thanikal, P.A to Director to the Post of Sr. P.A. w.e.f. 23-10-1998.
4. Shri S.A. Telpande, Jr. Clerk to the post of Sr. Clerk w.e.f. 23-10-1998.
5. Smt. V.V. Janaskar, Jr. Clerk to the post of Sr. Clerk w.e.f. 31-10-1998.

D. AWARDS AND NOMINATIONS

1. Dr. L.D. Deshmukh, Scientist has been awarded a Certificate for participating in the short-term course in Computer Language by the Director of Technical Education, Maharashtra State.

E. TRANSFERS

1. Shri Nehrulal Meena, Technical Assistant T-II-3 from Q.E. Unit of CIRCOT, Ludhiana to Headquarters w.e.f. 24-04-1998.
2. Shri R.G. Dhakate, Technical Assistant T-II-3 from Headquarters to Q.E. Unit of CIRCOT, Nagpur w.e.f. 16-10-1998.
3. Shri M. Bhaskar, Technical Assistant T-II-3 from GTC, Nagpur to Q.E. Unit of CIRCOT, Coimbatore w.e.f. 07-11-1998.
4. Shri John Robert, SS.Gr. III from Q.E. Unit of CIRCOT, Indore to GTC, Nagpur w.e.f. 05-11-1998.

5. Shri K. Venkanna, Technical Assistant T-II-3 from Q.E. Unit of CIRCOT, Guntur to CRIDA, Hyderabad w.e.f. 20-03-1999.

F. RETIREMENT

1. Shri S.N. Nagwekar, Technical Officer T-7 retired from service w.e.f. 30-06-1998 (AN).
2. Shri S.B. Kamble, Technical Assistant T-1 retired from service w.e.f. 30-07-1998 (AN).
3. Dr. G.R. Anap, Scientist (Sr.Scale) voluntarily retired from service w.e.f. 01-09-1998 (AN).

G. RESIGNATIONS/TERMINATION

1. Shri L.S. Takkar, SS.Gr. II resigned from service w.e.f. 30-12-1998.

H. TRAINING :

The following personnel have undergone training in various fields connected with thier working at the Institute.

1.	Advance Course in Colour	Mumbai	07-05-1998 to 09-05-1998	Shri A.J. Shaikh Dr. P.V. Varadarajan
2.	Training Course on Modern Techniques in Plant Bio-chemistry and Molecular Biology	Delhi	01-07-1998 to 15-07-1998	Kum. Thongbam Premila Devi
3.	Training Course in Computer	Nanded	20-07-1998 to 19-10-1998	Dr. L.D. Deshmukh
4.	Trainers' Training on the Use and Maintenence of High Volume Instrument (HVI) and Advanced Fibre Information System (AFIS)	USA	12-10-1998 to 21-10-1998	Shri K.B. Rajagopal Smt. S.V. Sukhi
5.	ARIS Hardware and Linux Network Operating System	Gujarat	23-11-1998 to 27-11-1998	Shri V.B. Suryanarayanan Shri D.R. Murthy
6.	Computer Training Course	Rahuri	25-11-1998 to 24-12-1998	Shri R.S. Darade

7.	HPLC Training	Gurgaon	03-12-1998 to 05-12-1998	Dr. P.V. Varadarajan Smt. N.D. Nachane
8.	Laboratory Assessor Training Course	Mumbai	21-12-1998 to 25-12-1998	Dr. P.V. Varadarajan Shri G. Viswanathan
9.	Refresher Course on Extension	Rahuri	04-01-1999 to 30-01-1999	Shri R.S. Darade
10.	Computer and Graphical Assisted Multivariate Data Analysis	New Delhi	08-03-1999 to 20-03-1999	Shri D.V. Mhadgut
11.	Induction Training for Direct Recruits - A.O. and F.A.O of ICAR	Delhi	22-03-1999 to 07-04-1999	Shri Devesh Nigam

I. OBITUARY :

1. Shri K.K. Kasar, Technical Assistant T-1 expired on 18-07-1998 while in service
2. Shri N.D. Walzade, S S.Gr. I expired on 02-11-1998 while in service
3. Shri V.V. Murudkar, Sr. Technical Assistant T-4 expired on 22-12-1998 while in service.

STAFF WORKING AT THE CENTRAL INSTITUTE FOR RESEARCH ON COTTON TECHNOLOGY AS ON 31-03-1999

(List does not include vacant posts)

LIST OF STAFF AT THE HEADQUARTERS

Scientific Personnel

Director

Dr. K. R. Krishna Iyer, M.Sc., Ph.D., F.T.A.

Head of Division

1. Dr. S. Sreenivasan, M.Sc., Ph.D., F.T.A., C.Text., F.T.I.
2. Dr. R. H. Balasubramanya, M.Sc. (Agri.)., Ph.D.

Principal Scientist

Dr. A. V. Ukidve, M.Sc., Ph.D., F.T.A.

Senior Scientist

1. Shri M. Ahmed, B.Sc., B.Text. (Text. Tech)
2. Dr. (Smt.) P. Bhama Iyer, M.Sc., Ph.D.
3. Dr. (Smt.) S. P. Bhatawadekar, M.Sc. Ph.D.
4. Dr. S. G. Gayal, M.Sc., Ph.D.
5. Shri A. K. Gupta, M.Sc., L.L.B., W.P.M.M.T.
6. Shri R. M. Gurjar, M.Sc.
7. Dr. G. F. S. Hussain, M.Sc., Ph.D.
8. Smt. J. K. Iyer, M.Sc.
9. Dr. R. P. Nachane, M.Sc., Ph.D., F.T.A., C.Text. F.T.I.
10. Dr. K. M. Paralikar, M.Sc., Ph.D., F.R.M.S.
11. Smt. Prema Nair, M.Sc.(Agri.)
12. Kum. C. R. Raje, M.Sc.
13. Shri A. J. Shaikh, M.Sc.
14. Dr. P. V. Varadarajan, M.Sc., Ph.D.
15. Dr. (Smt.) Vatsala Iyer, M.Sc., M.Phil., Ph.D.
16. Dr. N. C. Vizia, M.Sc., Ph.D.

Scientist (Senior Scale)

1. Shri P. Bhaskar, M.Sc.
2. Dr. S. K. Chattopadhyay, B.Sc. Tech. (Text.), M.Tech., (Text. Engg.), Ph.D.
3. Shri S. B. Jadhav, M.Sc.
4. Dr. D. N. Makwana, M.Sc., Ph.D.
5. Shri D. V. Mhadgut, M.Sc.
6. Shri G. S. Patel, M.Sc.
7. Shri K. H. Sawakhande, M.Sc.
8. Dr. (Smt.) Sujatha Saxena, M.Sc., Ph.D.

Scientist

1. Kum. Premiladevi Thongbom, M.Sc.
2. Shri N. Shanmugam, M. Text. (Textile Manufacture)

Technical Personnel

Technical Officer T-7

1. Shri T. K. M. Das, B.Sc., D.B.M., D.E.I.M., Dip.J., D.P.R., Cert. I.S.R.S.
2. Shri H. U. Gangar, B.E., (Electrical) Grade I.E.T.E.
3. Shri B. S. Ganvir, B.Sc.

Technical Officer T-6

1. Shri K. V. Ananthakrishnan, M.Sc., D.B.M.
2. Shri S.Chandrasekhar, L.T.M., A.T.A., Cert.S.Q.C.
3. Shri H. R. Laxmivenkatesh, D.T.T., A.T.A., L.T.I.
4. Shri E. A. Pachpinde, M.Sc.
5. Dr. (Smt.) S. D. Pai, M.Sc., Ph.D., F.T.A.
6. Shri R. S. Pathare, B.Sc.
7. Shri C. R. Sthanu Subramony Iyer, M.Sc., D.B.M., A.T.A.
8. Dr. (Smt.) Sudha Tiwari, Ph.D.
9. Shri V. B. Suryanarayanan, B.Sc., D.F.L. (German)
10. Shri G. Viswanathan, M.Sc., A.T.A.

Technical Officer T-5

1. Shri S. G. Dalvi, S.S.C., Cert. Wireman, Cert. Ref. & A.C., Govt. Elect. Sup.
2. Shri S. M. Gogate, B.Sc.
3. Dr. S. J. Guhagarkar, M.Sc., Ph.D.
4. Shri I. H. Hunsikatti, B.Sc., A.T.A.
5. Smt. S. R. Kamath, B.Sc.
6. Smt. A. A. Kathe, M.Sc.
7. Shri V. V. Kshirsagar, S.S.C., I.T.C.Cert. Elec. Super., Cert. F.&S., Conditioning Plant Operator
8. Shri P. K. Mandhyan, M.Sc., A.T.A.
9. Shri R. M. Modi, S.S.C., Cert. Photography
10. Shri D. N. Moon, B.Sc.
11. Smt. N. D. Nachane, B.Sc.
12. Shri R. D. Nagarkar, M.Sc.
13. Shri D. Radhakrishnamurthy, M.Sc., M.Phil.
14. Shri K. B. Rajagopal, B.Sc.
15. Shri S. Sekar, B.Sc.
16. Smt. R. K. Shahani, B.Sc., B.Lib., M.A.
17. Smt. S.V. Sukhi, M.Sc. D.F.L.(German)
18. Shri D. L. Upadhye, S.S.C.(Tech.)., N.C.T.V.T. (I.T.I.&C.T.I.)
19. Shri S. Vancheswaran, B.Sc.
20. Shri T. Venugopal, B.E. (Civil)
21. Shri M. V. Vivekanandan, B.Sc.

PERSONNEL

Senior Technical Assistant T-4

1. Shri S. Banerjee, M.Sc.
2. Smt. Bindu Venugopal, B.Sc.
3. Shri R. R. Chhagani, M.Sc.
4. Shri U. D. Devikar, B.Sc.
5. Shri P. B. Gurjar
6. Shri G. B. Hadge, M.Sc.
7. Shri S. N. Hedau, B.Sc.
8. Shri R. K. Jadhav, B.Sc.
9. Smt. K. K. Kale. B.A.
10. Shri D. U. Kamble, B.Sc.
11. Smt. S. R. Kawlekar
12. Shri H. S. Koli, B.Sc.
13. Shri M. Mohan, M.Sc., Dip. J.
14. Shri S. S. Patekar
15. Shri B. R. Pawar, B.Sc., LL.M.
16. Shri R. S. Prabhudesai, B.Sc., D.C.M.
17. Smt. C. D. Prabha, M.Sc.
18. Shri P. N. Sahane, D.I.F.T.
19. Smt. Sheela Raj, M.Sc.

Technical Assistant T-II-3

1. Shri V. N. Bhorkar, B.Sc.
2. Smt. Binu Sunil, M.Sc.
3. Shri D. B. Gadankush
4. Shri B. B. Gaykar (Driver)
5. Shri V. D. Kalsekar, B.Sc.
6. Shri S. V. Kokane, B.A.
7. Shri R. R. Mahangade, M.Sc.
8. Shri Nehrulal Meena, B.Sc.
9. Shri S. G. Shinde
10. Smt. Subasri Subrmanian, B.Sc.
12. Smt. N. A. Sonkusle, B.Sc.
12. Shri R. M. Sonke, B.Sc.

Category T-I-3

1. Shri D. V. Kambli (Wireman)
2. Shri G. D. Narkar (Carpenter)
3. Shri H. K. Pawar

Category T-2

1. Shri M. B. Chandanshive,
   Cert. Cot. Spin. (Machinist/Fitter)
2. Shri D. M. Correia,
   S.S.C., I.T.I., N.C.T.V.T. (Mechanic)

Category T-1

1. Shri G. G. Ambare
2. Shri M. G. Ambare
3. Shri A. R. Bane
4. Shri M. Y. Chandanshive
5. Shri G. S. Deorukhkar
6. Shri B. R. Jadhav
7. Shri N. D. Kambli
8. Shri R. R. Khurdekar
9. Shri T. S. Mhaske
10. Shri K. D. Mohite
11. Shri M. R. Nevrekar
12. Shri S. K. Parab
13. Shri S. V. Patil
14. Shri. D. A. Salaskar (Driver)
15. Shri B. K. Sawant
16. Shri S. K. Sawant
17. Shri C. V. Shivgan, H.S.C., Cert.Wireman, Cert. Electrician, N.C.T.V.T., Cert. Elec.Supr. (PWD).. Cert.M.&A.W.(Technician)
18. Shri M. B. Thokrul
19. Shri V. Y. Unhalekar
20. Shri S. A. Waghela

Auxiliary Personnel

Canteen Staff

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

Administrative Personnel

Administrative Officer

Shri N. N. Lotha, B.Tech. (Agri.)

Finance and Accounts Officer

Shri Devesh Nigam, M.Sc.

Assistant Administrative Officer

1. Shri P. D. Sonawane, B.A., L.L.B.
2. Shri K. Sudhakaran
3. Shri M. Z. Bhagat
4. Smt. M. V. Kamerkar, B.A.

Superintendent

Shri G. Moosad, B.Com.

PERSONNEL

Assistant

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

Hindi Translator

Smt. K. R. Joshi, M.A.

Sr. P.A. to Director

Shri Venu Thanikal

Stenographer Gr.II

Smt. S. D. Dudam, M.A

Stenographer

1. Smt. T. T. Souz
2. Smt. U. N. Bhandari

Junior Stenographer

1. Smt. R. R. Tawde B.Com.
2. Kum. V. S. Nayak
3. Smt. S. G. Parab B.A.

Senior Clerk

1. Shri E. T. Gurav
2. Shri K. Parleshwar
3. Smt. S. R. Shirsat, B.A.
4. Shri N. V. Kambli
5. Shri J. R. Mangale, B.Com.
6. Smt. V. V. Janaskar, M.A.

Junior Clerk

1. Shri S. D. Ambolkar
2. Shri R. K. Pallewad, B.A.
3. Shri P. V. Jadhav
4. Smt. S. P. Paiyala
5. Shri V. M. Sable
6. Smt. J. R. Chavkute
7. Shri A. K. Kunjipalu
8. Kum. B. G. Menon
9. Shri S. V. Kasabe, B.Com.
10. Shri S. S. Angane
11. Shri A. R. Gujar
12. Shri T. D. Dhamange, B.Com.
13. Shri S. N. Bandre (Temporary)

Sr. Gestetner Operator

Shri A. B. Sawant

Supporting Staff Gr. IV

Shri C. Mhatri

Supporting Staff Gr. III

1. Shri N. J. Kharat
2. Shri R. B. Jadhav
3. Shri M. B. Gurve
4. Shri O. T. Thapa
5. Shri B. R. Satam
6. Shri D. M. Chougule
7. Shri S. D. Gurav
8. Shri R. S. Rane
9. Shri M. K. Ghadge
10. Shri M. Z. Rathi
11. Smt. T. V. Bhowar
12. Shri N. Singh
13. Smt. B. R. Balmiki

Supporting Staff Gr. II

1. Shri D. B. Temgire
2. Shri D. M. Raje
3. Shri C. S. Salvi
4. Shri T. B. Khan
5. Shri K. T. Mahide
6. Shri K. T. Ghogale
7. Shri R. R. Gosai
8. Shri M. M. Katpara
9. Shri M.A.A. Rashid
10. Shri G. N. Mayawanshi
11. Shri H. B. Vesmiya
12. Shri M. J. Sumra
13. Shri C. P. Solanki
14. Shri S. K. Bobate

Supporting Staff Gr. I

1. Shri P. P. Patil
2. Shri R. G. Tak
3. Shri R. P. Karkate
4. Shri S. B. Worlikar
5. Shri S. G. Phalke
6. Shri M. M. Kadam
7. Shri D. G. Gole
8. Shri C. D. Acharekar
9. Shri M. K. Prabhulkar
10. Shri J. D. Sakpal
11. Shri V. B. Khandeshe
12. Shri A. D. Sonawane
13. Shri S. D. Magar
14. Shri V. Murugan
15. Shri S. R. Tondse
16. Shri V. T. Poojari
17. Shri S. P. Naik
18. Shri M. N. Kamble
19. Smt. K. B. Thapa

PERSONNEL

LIST OF STAFF AT THE QUALITY EVALUATION UNITS

AKOLA

Technical Officer T-5	:	Shri N. V. Bansode, B.Sc.
Supporting Staff Grade I	:	Shri S. R. Patode

COIMBATORE

Technical Officer T-6	:	Smt. Santa V. Nayar, B.Sc.
Technical Officer T-5	:	Shri S. Venkatakrishnan, MSc., A.T.A
Technical Assistant T-4	:	Shri K. Thiagarajan, M.Sc.
Technical Assistant T-II-3	:	Shri M. Bhaskar, Dip. Ref. & Air-Cond.
Operator T-I-3	:	Shri K. V. Nair
Supporting Staff Grade IV	:	Shri N. Arumugham
Supporting Staff Grade III	:	Shri V. M. Subramanian

DHARWAD

Technical Officer T-5	:	Shri M. T. Danoli
Technical Assistant T-II-3	:	Shri K. Narayanan, B.Sc.
Supporting Staff Gr.I	:	Shri C. J. Bagalkoti
		Shri A. F. Gudadur

GUNTUR

Technical Officer T-5	:	Shri S. Mukundan, B.Sc.
Supporting Staff Gr.IV	:	Shri Ch. Thimmanna
Supporting Staff Gr.III	:	Shri V. Y. M. Suvarchala Rao

HISAR

Senior Technical Assistant T-4	:	Shri Amarpal, B.Sc.
	:	Shri Jal Singh, B.Sc.
Technical Assistant T-1	:	Shri Gian Singh

INDORE

Technical Assistant T-II-3	:	Shri P. S. Anil kumar, B.Sc.
Supporting Staff Gr.IV	:	Shri H. S. Bhabar

LUDHIANA

Technical Officer T-8	:	Shri Ram Parkash, B.Sc., L.L.B.
Sr. Technical Assistant T-4	:	Shri Hamid Hassan, M.Sc.
Supporting Staff Gr.I	:	Shri Satyanarayan Gope
		Shri Sarup Singh

NAGPUR

Sr. Scientist	:	Shri B. P. Nema, M.Tech. (Agril. Engg.) (Farm Machinery & Power)
Scientist	:	Shri P. G. Patil, M.Tech. (Post-Harvest Engg.)
		Shri T. S. Manojkumar, M.E. (Agril) (Agril. Structure & Process Engg.)
		Dr. R. Murugesan, M.E. (Agri.)., Ph.D.
		Shri Vishnu Arude, M.Tech.
Technical Officer T-6	:	Shri V. M. Kulmethe, B.Sc.
Technical Assistant T-4	:	Shri S. L. Bhanuse, B.Sc.
		Shri R. G. Khakate, B.Sc.
		Shri V. L. Rangari, B.Sc.
Technical Assistant T-2	:	Shri B. V. Shirsath, B.A., I.T.I.
Technical Assistant T-1	:	Shri C. L. Mundale
		Shri P. N. Raut, S.S.C. (Tech), H.S.C., Dip.Elect.Eng., N.T.C., N.A.C., N.C.T.V.T.
Senior Clerk	:	Shri B.D. Dhengale
		Smt. G. G. Palorkar, B.A.
	:	Shri S. A. Telpande, M.Com.
Driver (T-1)	:	Shri R. A. Suddawar
Machine Operator (T-1)	:	Shri B. H. Umredkar
Technical Assistant T-1	:	Shri John Robert
Supporting Staff Gr.II	:	Shri A. R. Chutale
		Shri J. P. Patel
		Shri R. B. Kautkar
		Shri P. S. Panchbudhe, M.A.
		Shri M. P. Tohokar
Supporting Staff Gr.I	:	Shri R. G. Matel
		Shri R. C. Rokde
		Shri M. G. Bhandkkar

NANDED

Scientist	:	Dr. L. D. Deshmukh, M.Sc., Ph.D.
Technical Assistant T-II-3	:	Kum. P. L. Indurkar, B.Sc.
Supporting Staff Gr.IV	:	Shri L. R. Indurkar
Supporting Staff Gr.II	:	Shri S. N. Umare

PERSONNEL

RAHURI

Technical Officer T-5	: Shri R. S. Darade, B.Sc.
Technical Assistant T-II-3	: Shri C. M. More, B.Sc.
Supporting Staff Gr.II	: Shri D. G. Kamble

SIRSA

Senior Technical Assistant T-4	: Shri Udai Vir Singh, B.Sc., B.Ed.
Supporting Staff Gr.I	: Shri Mahabir Singh

SRIGANGANAGAR

Senior Technical Assistant T-4	: Shri Matish Chandra, M.Sc.
Supporting Staff Gr.IV	: Shri Vijendra Singh
Supporting Staff Gr.III	: Shri Sanwarmal Saini

SURAT

Scientist (Sr. Scale)	: Shri Y. Subrahmanyam, M.Sc.
Technical Officer T-6	: Shri M. C. Bhalod, B.Sc.
Technical Officer T-5	: Shri G. G. Mistry, B.Sc.
Sr.Technical Assistant T-4	: Shri M. B. Patel, B.Sc.
Senior Clerk	: Shri J. I. Parmar, B.Com.
Technical Assistant T-1	: Shri J. B. Dhodia
Supporting Staff Gr.III	: Shri K. M. Rathod
Supporting Staff Gr. I	: Shri M. G. Sosa

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