Cotton Technological Research Laboratory

Indian Council of Agricultural Research

Annual Report
1983

BOMBAY

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1. INTRODUCTION

While presenting this sixtieth Annual Report of Cotton Technological Research Laboratory (CTRL) which covers the calendar year 1983, it would be appropriate to give a brief account of this institution, the first of its kind in the country.

CTRL was founded in the year 1924 by the erstwhile Indian Central Cotton Committee (ICCC) mainly with the following two objectives :

(i) to undertake spinning tests on various strains of cotton received from Departments of Agriculture in various parts of the country;

(ii) to carry out tests for the fibre properties of cotton so as to relate these fibre properties with the spinning values of cotton.

CTRL has been functioning in close collaboration with the Departments of Agriculture in various states for evolving new cotton strains, all through the years. When all the commodity committees including ICCC were abolished in 1966, the administrative control of CTRL was passed on to the Indian Council of Agricultural Research (ICAR). The research work of CTRL has since been intensified and reoriented in the light of the overall responsibility vested with the ICAR to undertake, aid, promote and co-ordinate agricultural and animal husbandry research and education and its application in practice. The years that followed witnessed concerted efforts on the part of CTRL in collaboration with cotton breeders and agricultural scientists to produce more and better quality cottons as also to increase better utilisation of cotton lint as well as cotton plant by-products. These endeavours helped to create an impact on the general economy of the country by way of saving in foreign exchange, etc.

The main functions of CTRL are :

1. To participate actively in the programmes for improvement in production and quality of cotton in India by evaluating the quality of new strains evolved by agricultural scientists and giving them necessary technical guidance.
2. To carry out research on physical, structural and chemical properties of cotton in relation to quality and processing performance.
3. To carry out research investigations on the ginning problems of cotton.

4. To investigate the greater and better utilisation of cotton, cotton waste, linters, cotton seed, etc.
5. To help the trade and industry by providing reliable and accurate data on quality of representative trade varieties of Indian cottons.
6. To issue authoritative reports on the samples received for tests from Government departments.
7. To collect and disseminate technical information on cotton.

Library

CTRL has an up-to-date library of books on cotton, cotton technology and allied subjects. The total number of books as on December, 1983 was 3501 with the addition of 77 books during the year. The number of bound volumes of important scientific journals added during the year was 145 and the total number of such bound volumes as on December, 1983 stands at 4378. The library received regularly about 198 journals covering a wide spectrum of scientific subjects, of which 105 were subscribed and the remaining received on exchange basis or as complimentary.

Purchase of New Equipments

A list of some of the new equipments purchased during 1983 has been given in Annexure I.

Distinguished Visitors

The Press Council consisting of the following representatives from national dailies and the news agencies visited CTRL on February 15, 1983 to study the work carried out by CTRL as a pioneer institution in the field of cotton research and to appraise of the achievements in the credit of CTRL all through the years :

1. Shri Surinder Sood,
   Agricultural Correspondent,
   Times of India, New Delhi.
2. Shri N. R. Sharma,
   Correspondent, Navbharat Times, New Delhi.
3. Shri Sunil Saraf,
   Correspondent, UNI, New Delhi.
4. Shri N. R. Nayak,
   Special Correspondent, PTI, New Delhi.
5. Shri Devinder Sharma,
   Agricultural Correspondent, Indian Express, New Delhi.

In addition, official visits to CTRL were made by Dr. O. P. Gautam, Director General, ICAR, Dr. J. S. P. Yadhav, Chairman, ASRB, Dr. M. V. Rao, Deputy Director General, ICAR, Dr. C. Kempanna and Dr. A. Alam, both Asstt. Directors General, ICAR, Shri T. P. Ranganathan, Director (Finance), ICAR, Shri N. S. Sehgal, Under Secretary (E.E.), ICAR, Shri A. S. Bhatnagar, Legal Advisor, ICAR and Shri M. G. Menon, Under Secretary, DARE.

A list of other distinguished visitors during the year is presented as Annexure II.

Management Committee

The Management Commitee meeting of CTRL was held three times during 1983 — on March 24, July 26, and December 27.

At the first meeting held on March 24, 1983, the Chairman mentioned that the ICAR representative and outside members of the Committee were not finalised by the ICAR and that the ICAR had, however, permitted the meeting to be conducted with the available members. In addition, he pointed out that out of the four Scientists of the CTRL recommended, approval had been received only for three members. The items considered at the first meeting included action taken on the recommendations of the earlier meeting, progress of expenditure under Plan and non-Plan, action taken on the recommendations of the Grievance Cell and Institute Joint Council, progress of research work and new project proposals for 1983, etc., apart from items such as progress of works, inauguration of new building, diamond jubilee celebration of CTRL, adjustment of posts to cope up with the work load, action taken on the recommendations of the QRT appointed for CTRL and consideration of the two proposals for consultancy. Suitable comments/recommendations/observations were offered in each of the items, wherever necessary.

The second meeting held on July 26, 1983 had items such as organisation of a Breeders', Ginners' and Spinners' Conference in 1984, action to be taken on the QRT Report, apart from such usual items as action taken on the recommendations of the earlier meeting, progress of expenditure under Plan and non-Plan, progress of works, action taken on the recommendation of the Staff Council and Grievance Cell. Suitable suggestions and recommendations were made on various items. wherever necessary.

At the meeting held on December 27, 1983, discussions were held on progress of construction works in which recommendation was made

to plan staff quarters to accomplish 40% satisfaction limit while formulating the VII Plan, action taken on the recommendations of the Institute Joint Council which dealt with declaration of permanency, supply of liveries, classification of technical and auxiliary posts wherein recommendation was made to treat such posts as conditioning plant operators, workshop machinery operators, spinning fitters, etc., as technical, as against their auxiliary status in the reclassified list, and expediting the appointment of state Govt. representatives, accounts officer and non-official representative on the Management Committee. Another recommendation made was regarding the patenting procedure. The Committee felt that the existing procedures for patenting were rather cumbersome and involved considerable delay and therefore, the matter should be taken up with the Council for reconsideration of the procedures by an indepth study. Some of the problems relating to administration of the office also figured in the discussions during the meeting.

Staff Research Council

The eighty second meeting of the Staff Research Council (SRC) was held in five preliminary sessions on March 1, 2, 15, 17 and 19, 1983 and a final session with the Management Committee on March 24, 1983.

In the preliminary sessions, discussions were held on the progress of research work in various Divisions/Sections as per the programme of work finalised in 1982 and also the new project proposals received for consideration for the year 1983. Eleven new project proposals were approved with some suggestions/modifications. A tentative programme of research work for the year 1983 drawn up for consideration at the final session with the Management Committee, has been finalised and approved. The Director chaired all the sessions and the Heads of Divisions and Scientist members of the Management Committee from CTRL attended all the preliminary sessions as well as the final session. The discipline-wise sessions were attended by Scientists (S, S-1, S-2), from CTRL and Technical Officers (T-5 and T-6) apart from Divisional Heads and Management Committee Members.

In the joint session with the Management Committee, Divisional Heads, Scientists in the grade S-2 and Technical Officers (T-6) attended. During the course of discussion, the Director brought to the notice of all the members, the relevant recommendations of the quinquennial review team appointed for the achievement audit of CTRL and pointed out that the appropriate recommendations should be borne in mind, while formulating new project proposals for the different disciplines.

Inter-Institutional Projects

The following two inter-institutional projects were in operation during the year :

1. Studies on deburring of raw wool using mechanical device (in collaboration with Central Sheep and Wool Research Institute (CSWRI), Avikanagar), and
2. Durable flame retardant (FR) finishes for textiles (in collaboration with Textiles Committee, Govt. of India, Bombay).

No progress could be made on the first project, as scoured wool samples were not received from either CSWRI or the Rajasthan Sheep and Wool Marketing Federation, Jaipur, in spite of constant efforts.

Operational Research Project

An Operational Research Project on the 'Utilisation of the Willow-dust, a Textile Mill Waste, for the Production of Bio-energy to Meet Partly the Energy Requirements of the Textile Industry', funded by the Commission for Additional Sources of Energy (Department of Non-conventional Energy Sources) was under way at Apollo Mills, Bombay. The main objective of the project was to scale up the process of the biogas production from willow-dust using a batch fermentation process developed by CTRL and BTRA to meet partly the energy requirements of the textile industry.

Apollo Mills, Bombay which is a unit of the National Textile Corporation, South Maharashtra, have agreed to install the biogas plant to process the willow-dust. Presently, the mill is consuming about 65 kg of LPG daily for their laboratory, canteen and singeing operations. The average production of willow-dust in the Mill has been around 12 tonnes per month. If the mill has to fully meet with the energy requirement of 65 kg gas, the quantity of charge should be around 27 tonnes per month. Instead of depending on other mills for the raw materials and also to avoid transportation of the material, it has been decided to put up a plant to process only the available willow-dust in that mill.

CTRL design consisted of 6 digesters to handle 12 tonnes of willow-dust with a common gas holder to store 70 m^3 biogas. BTRA design consisted of 3 digester-cum-gas holder to handle 12 tonnes of willow-dust. The digesters will be fabricated with RCC and the gas holder with MS. The detailed blue prints of both the designs have been submitted to

the mill to install both the plants. Trials will be undertaken simultaneously on both the designs and the data will be collected.

Integrated Cotton Development Project

The progress made during the year with regard to construction of buildings, development of necessary infra-structure, procurement of equipment, etc. for the Ginning Training Centre at Nagpur, was as follows :

Construction Work : The construction of building for installation of ginning machinery was almost over. Work was under progress to instal the imported ginning and pressing machinery in the above building. A mezzanine floor was being constructed in the building for housing administrative section. As regards Trainees' Hostel, Council's approval was received and the first instalment of Rs. 1.25 lakhs has been paid to CPWD.

Development of Site Roads, Water and Power Requirements for the Ginning Training Centre : The construction of roads and compound wall has been completed. Also, a small building has been constructed to house the Electric Sub-station. Temporary electric connection has been provided for the Ginning Training Centre to facilitate installation of machinery.

Equipment : The modern Saw Gin and Bale Press ordered from USA and imported earlier have been transported to Nagpur for erection. Foundation work for installation of the machinery was almost complete. Action has also been taken to procure Digital Fibrograph, Micronaire, Stelometer, two sets of small-scale Spinning Unit, Lea Tester, etc.

Staff : Action was taken to recruit a suitable scientist to fill up the vacant post of Scientist S-2, and it was expected that necessary orders will be issued by the ICAR to the selected candidate soon. All the three posts of Watchmen have been filled up to ensure safety of the building and the machinery under erection.

Post Graduate Training

The recognition granted to CTRL by the University of Bombay as a post graduate institution was continued during the year for guiding students for M.Sc. and Ph.D. degrees in Physics (Textiles), M.Sc. degree in Physical Chemistry and Organic Chemistry, M. Text. and Ph.D. degrees in Textile Technology and Ph.D. degree in Bio-Physics.

Nine students were being guided for M.Sc. Physics (Textiles), two for Physical Chemistry and one for M. Text. (Spinning). One student was receiving guidance for Ph.D. degree in Physics (Textiles).

Dr. V. Sundaram, Director, Dr. N. B. Patil, Senior Scientist (Physics), Shri M. S. Parthasarathy, Senior Scientist (Mechanical Processing), Dr. V. G. Munshi, Senior Scientist (Quality Evaluation), Dr. S. N. Pandey, Scientist (Chemical Studies), Dr. K. R. Krishna Iyer, Scientist (Physics), Kum. I. G Bhatt, Scientist (Chemical Studies) and Dr. P. K. Chidambareswaran. Scientist (Physics) continued as research guides for various degrees.

During the year, one Ph.D. and one M.Sc. thesis were submitted by two students to the Bombay University and the respective degrees were awarded to them.

Finance

A statement showing sanctioned budget grant of CTRL and actual expenditure for the financial year 1982-83 has been furnished in Appendix I. As could be seen from the statement, the actual expenditure under non-plan was Rs. 54,71,703.00 as against the sanctioned grant of Rs. 54,72,000.00. An expenditure of Rs. 56,24,268.00 was incurred on the scheme for Modernisation and Strengthening of CTRL for Intensive Research on Cotton as against the sanctioned grant of Rs. 56,25,000.00 (An expenditure of Rs. 26,375.00 was incurred under Integrated Cotton Development Project).

Significant Findings

Two new cotton varieties, viz. DS.1 which is an early maturing **arboreum** evolved at Sirsa by gamma-irradiation, and TNB-1 a **barbadense** Egyptian type identified at the Agricultural Research Station, Tamil Nadu, were recommended for release during the year, under AICCIP.

A Cotton Boll Toughness Tester has been developed by CTRL with which cotton varieties could be classified according to their boll strength index, for use in selective breeding experiments to improve pest resistance of cotton bolls.

The finding that glucose rings in the amorphous domains of cellulose films show a tendency for orientation parallel to the film surface, has emerged from a study of birefringence and x-ray diffraction on cellulose films modified by swelling and stretching treatments.

Swelling and stretching in alkali followed by neutralisation can bring about pronounced changes in the structural characteristics of normal viscose rayon filaments without any degradation; stretch imparted during the treatment leads to high levels of molecular orientation and crystallinity so far not reported for normal rayon.

Marked improvements in WRA, DP ratings and other physico-chemical properties of cotton fabrics were noticed, when crosslinked with 10% DMDHEU in the presence of mixtures of catalysts.

Studies carried out on the antibiotic property of gossypol on some typical gram positive and gram negative organisms exhibited that gram positive organisms are suceptible to free gossypol toxicity.

In a collaborative project for imparting fire retardancy (FR) to fabrics, it was noticed that Ph PvA treatment was more suitable for giving FR finish as the liquor bath preparation was very easy and as the treated fabrics exhibited better flame proofing properties with practically no strength loss.

In a study of better utilisation of cotton linters, it was observed that it is very difficult to remove leaf-bits, hulls bracts, etc. present as trash in cotton linters by digestion and that their presence may lead to increase in ash and iron content of linters.

Particle boards were successfully prepared from cotton seed hull using different concentrations of the binding resin and catalysts.

Various types of good quality writing paper have been prepared using cotton plant stalk as the chief raw material.

2. PROGRESS OF RESEARCH

A brief resume of the progress of research made during the year 1983 at CTRL is given below :

Evaluation of the Quality of Cotton Samples received from Agricultural Trials

Large number of cotton samples are received for technological evaluation every year from various trials being conducted at several cotton growing states in the country. These samples are mainly pertaining to breeding, agronomy and related trials as well as the All India Co-ordinated Cotton Improvement Project (AICCIP) and different on-going research investigations.

The number of such samples received for tests during the years, 1980, 1981 and 1982 together with the corresponding average figures for the quinquennium 1976-80, are given in Table 1(a). In Table 1(b), the number of samples tested at the Regional Quality Evaluation Units of CTRL during 1983 are summarised.

The samples received from agricultural trials are tested in the order of their receipt and test reports are issued as soon as they are ready. The test results on samples of Trade Varieties and Standard Indian Cottons are reported as Technological Circulars as and when tests are completed and later on compiled for the whole season and published as two separate Technological Reports — one for Trade Varieties of Indian Cottons and the other for Standard Indian Cottons.

Test reports are generally not issued on Technological research samples, as the relevant test results will appear in the respective research publications.

In addition, some samples are also received for miscellaneous tests such as determination of quality of ginning, neppiness, oil content in cotton seed, etc.

The state-wise figures for the number of samples which were tested for fibre characteristics and spinning performance have been given in Table 2 under two captions :

(i) All India Co-ordinated Cotton Improvement Project (AICCIP), and

(ii) Other State schemes.

TABLE 1 (a) : NUMBER OF COTTON SAMPLES RECEIVED FROM DIFFERENT AGRICULTURAL TRIALS FOR TESTS AT CTRL

Type of Test	Average for the quinquenium 1976-80	1981	1982	1983
1	2	3	4	5
Fibre & Full Spinning	175	137	216	183
Fibre & Microspinning	2093	1570	1794	1695
Microspinning alone	—	—	—	—
Fibre tests alone	225	131	78	52
Mill Tests	14	14	2	13
Standard Cottons	24	18	32	18
Trade Varieties — Lint	27	25	1	27
Trade Varieties — Kapas	50	75	42	64
Technological Research	96	104	196	323
Miscellaneous	22	2	—	97
Total	2726	2076	2361	2472

TABLE 1 (b) : NUMBER OF SAMPLES TESTED AT THE QUALITY EVALUATION UNITS

Unit	Total number of cotton samples tested				
	Length	Fineness	Maturity	Tenacity	Micro-spinning
Akola	1327	257	257	257	—
Coimbatore	1224	1224	1224	1224	394
Dharwad	1286	1286	1286	1286	—
Guntur	389	323	383	383	—
Hissar	267	879	891	142	—
Indore	651	651	687	751	—
Ludhiana	810	1523	1220	250	—
Nagpur	923	911	864	970	—
Nanded	797	797	809	797	—
Rahuri	433	430	430	348	—
Sriganganagar	622	422	422	218	—
Surat	12360+	9186++	9273	4666	354

\+ Out of 12360 samples tested at Surat, 12325 were evaluated on Fibrograph and 35 samples on Baer Sorter. From the samples tested on Fibrograph, 6672 were evaluated on the basis of one pair of combs.

++ Out of these, 4088 samples were evaluated for fineness on Micronaire instrument by carrying out one test.

TABLE 2: NUMBER OF SAMPLES TESTED AND REPORTED IN 1983

State	Fibre and full spinning	Fibre and Micro-spinning	Micro-spinning	Fibre Tests	Total
(i) All India Co-ordinated Cotton Improvement Project (AICCIP)					
1. Andhra Pradesh	—	—	—	—	—
2. Gujarat	60 (9)	24 (3)	—	—	84 (12)
3. Haryana	17 (3)	103 (15)	—	10 (2)	130 (20)
4. Karnataka	3 (1)	456 (44)	—	—	459 (45)
5. Madhya Pradesh	—	158 (12)	—	—	158 (12)
6. Maharashtra	2 (1)	382 (49)	—	—	384 (50)
7. New Delhi	—	16 (2)	—	—	16 (2)
8. Punjab	39 (8)	61 (9)	—	—	100 (17)
9. Rajasthan	—	95 (7)	—	12 (1)	107 (8)
10. Tamil Nadu	11 (3)	81 (7)	—	—	92 (10)
11. Uttar Pradesh	—	40 (8)	—	16 (3)	56 (11)
Total	132 (25)	1416 (156)	—	38 (6)	1584 (187)
(ii) Other State Schemes					
1. Andhra Pradesh	—	—	—	—	—
2. Gujarat	19 (19)	2 (2)	—	—	21 (21)
3. Haryana	6 (1)	60 (6)	—	—	66 (7)
4. Karnataka	6 (6)	—	—	—	6 (6)
5. Madhya Pradesh	3 (3)	—	—	—	3 (3)
6. Maharashtra	48 (32)	185 (25)	—	78 (2)	311 (59)
7. New Delhi	—	—	—	—	—
8. Punjab	—	—	—	—	—
9. Rajasthan	4 (4)	12 (1)	—	—	16 (5)
10. Tamil Nadu	5 (3)	1 (1)	—	—	6 (4)
11. Uttar Pradesh	—	—	—	—	—
Total	91 (68)	260 (35)	—	78 (2)	429 (105)

ALL INDIA CO-ORDINATED COTTON IMPROVEMENT PROJECT

The Indian Council of Agricultural Research formulated the All India Co-ordinated Cotton Improvement Project (AICCIP) in 1967 with a view to coordinate research work in various disciplines as well as to bring together Agricultural Universities and Central Institutes. Since, the basic approach under this project is to look into the problems of production of cotton with a multi-disciplinary slant, there has been spectacular improvement not only in yield but also in quality of Indian cottons.

Since the sowing and harvesting seasons for the cotton crop differ widely in various regions of the country, the breeding programmes are formulated Zone-wise. The breeding material available with the cotton breeders of various states is systematically screened each year and the promising material is being subjected to further screening. Maintenance of 'Germ Plasm' and Initial Evaluation Trial are the preliminary stages of screening, while Co-ordinated Trials, Pilot Project Trials, etc. are the advanced trials in this project. Data on economical, ancillary and technological characters are discussed in the panel meetings.

This is the sixteenth year of the Co-ordinated Cotton Improvement Project and test data on various trials were presented during the year in the panel meetings held at New Delhi for North Zone, Nagpur for Central Zone and Madurai for South Zone.

NORTH ZONE

North Zone comprises the states of Punjab, Haryana, Rajasthan and Uttar Pradesh. Most of the areas in these states are under irrigation and hence the yield levels are generally higher than those of the remaining cotton growing states.

The major emphasis in this Zone is given to identify high yielding American type strains, superior to the existing varieties. Attention is also given to identify strains which are early maturing (i.e. sowing period to harvesting period about 150 days). Trials are also conducted to evolve high yielding **desi** varieties.

G. hirsutum Trials

The Co-ordinated Varietal Trial of **G. hirsutum** was conducted under Normal Plant Type at Faridkot, Hissar, Kanpur, Ludhiana, Mathura, Muktsar, Sirsa and Sriganganagar. This trial was also conducted for the strains which mature earlier than in normal period at Faridkot, Hissar, Kanpur, Ludhiana, Mathura, Muktsar, Sirsa and Sriganganagar.

PROGRESS OF RESEARCH

The ranges of 2.5% span length, Micronaire value, maturity and bundle strength along with the spinning potential of various strains under this trial have been complied in Table 3.

Promising strains from these trials at different locations are given below :

Location	*Count*	*Promising strains*
	Normal Plant Type	
Faridkot	40s	F. 414, FP. 286 and FP. 233
Hissar	40s	FP. 286 and LH. 886
Kanpur	40s	FP. 286
Ludhiana	40s	LH. 886 and LH. 751
Mathura	30s	FP. 286
Muktsar	40s	F. 414 and FP. 286
Sirsa	30s	FP. 286 and RS. 510
Sriganganagar	30s	RS. 610, RS. 510, H. 894, H. 939, FP. 233, FP. 286, LH. 886, LH. 580 and LH. 768
	Early Maturing Type	
Faridkot	30s	F. 414
Hissar	40s	B N. and H. 777
Kanpur	40s	H. 888, H. 862 and B.N
Ludhiana	40s	H. 862, FP. 438 and F. 414
Mathura	30s	H. 862 and H. 777
Muktsar	40s	H. 862 and F. 414
Morena	40s	H. 888, H. 862, B.N., C. 59-228 and J. 34 x B.N
Sirsa	30s	HS. 50 and H. 862
Sriganganagar	30s	H. 888

Preliminary Varietal Trial for Normal Plant Type was conducted at Faridkot, Hissar, Ludhiana, Muktsar, Sirsa and Sriganganagar. This trial for Compact Plant Type was also conducted at Faridkot, Kanpur, Ludhiana, Mathura, Muktsar, New Delhi and Sriganganagar.

TABLE 3: SUMMARY OF TEST RESULTS OF STRAINS TRIED IN CO-ORDINATED VARIETAL TRIAL (CVT) OF *G. HIRSUTUM* IN NORTH ZONE

Location	No. of samples	Range				Count Spun	Spinning performance		Control
		2.5% span length (mm)	Micronaire value (μg/in)	Maturity	Bundle strength (g/t)		A	B	
1	2	3	4	5	6	7	8	9	10
				Normal Plant Type — Br04(a)					
Faridkot	6F	21.9—25.1 (23.2)	3.7—4.6 (4.2)	70—77 (75)	45.0—49.8 (48.1)	40s	3	1	F.414
Hissar	6F	23.0—25.5 (23.9)	3.8—4.7 (4.2)	68—79 (72)	45.0—49.8 (47.2)	40s	2	—	—
Kanpur	6M	22.6—26.1 (24.6)	3.4—4.6 (4.1)	58—70 (65)	42.3—50.9 (47.3)	40s	1	2	C.A.7
Ludhiana	6F	21.7—24.3 (23.0)	4.1—5.1 (4.5)	72—79 (75)	48.2—50.9 (49.8)	40s	2	4	F.414
Mathura	3M	23.2—23.5 (23.4)	4.1—4.5 (4.3)	70—81 (75)	45.6—48.8 (47.3)	30s	1	—	—
Muktsar	7F	23.2—26.5 (24.8)	3.9—4.9 (4.4)	56—71 (67)	43.4—47.7 (46.0)	40s	3	2	F.414
Sirsa (HAU)	6M	20.8—25.5 (23.2)	4.2—5.2 (4.1)	66—83 (77)	44.0—49.3 (47.1)	30s	2	2	H.777
Sriganganagar	17M	21.4—26.9 (23.6)	3.4—5.0 (4.1)	59—83 (71)	40.7—50.9 (45.9)	30s	9	9	RS.513

— Table Contd.

1	2	3	4	5	6	7	8	9	10
				Early Maturing Type — Br04(c)					
Faridkot	6M	21.5—24.4 (23.2)	4.5—5.0 (4.8)	69—84 (78)	45.0—48.2 (46.4)	30s	1	—	F.414
Hissar	5F	24.2—26.2 (25.0)	3.7—4.0 (3.9)	71—77 (74)	40.7—48.8 (46.7)	30s	1	—	H.777
Kanpur	5M	24.3—26.5 (25.2)	4.0—4.4 (4.2)	64—74 (68)	42.9—49.8 (47.0)	40s	2	4	CA-10-2
Ludhiana	7F	22.2—25.1 (24.2)	4.2—4.8 (4.6)	68—77 (72)	42.3—51.5 (46.8)	40s	3	2	F.414
Mathura	5M	22.6—26.2 (23.8)	4.2—4.8 (4.5)	68—78 (75)	45.0—49.8 (46.9)	30s	2	1	H.777
Morena	12M	24.7—27.5 (25.8)	3.8—4.2 (4.0)	72—84 (76)	45.0—52.0 (48.2)	40s	7	5	C.59-22-8
Muktsar	7F	22.9—25.6 (24.4)	4.0—4.9 (4.5)	68—84 (74)	40.2—47.7 (45.5)	40s	2	1	F.414
Sirsa (HAU)	5M	22.5—25.6 (24.0)	4.0—4.4 (4.1)	60—79 (71)	42.9—48.8 (45.1)	30s	2	3	H.777
Sirsa (IARI)	6M	22.3—25.1 (23.4)	3.7—4.4 (4.0)	64—74 (68)	43.4—53.4 (48.6)	30s	3	2	H.777
Sriganganagar	10M	22.8—25.5 (24.4)	3.6—4.4 (4.0)	50—73 (64)	39.1—45.6 (43.2)	30s	2	2	B.N.

A : Samples spinnable to the count selected.

B : Samples having spinning performance on par or better than control
Figures in brackets indicate averages.

M — Microspinning

F — Full Spinning

The following strains fared well at the location indicated :

Location	*Count*	*Promising strains*
Faridkot	30s	L.H. 839, FP. 572, F. 414 and FP. 470
Hissar	30s	FP. 401, FP. 410, FP. 572, H. 806-1, FP. 480 and H. 777
Ludhiana	40s	FP. 401, FP. 572, FP. 505, B.N. and F. 414
Muktsar	30s	FP. 572, LH. 640, LH. 728, FP. 505, H. 929, LH. 372, H. 877, FP. 740 and F. 414
Sirsa	30s	H. 806-1
Sriganganagar	30s	FP. 401, FP. 410, FP. 572, H. 941, FP. 929, LH. 640, LH. 728, DH. 181, RS. 626, HS. 37, FP. 470, FP. 480, DH. 66-4, DH. 85, H. 870-2 and B.N

The Initial Evaluation Trial was conducted at Faridkot, Hissar, Sirsa and Sriganganagar. Promising strains are given below :

Location	*Count*	*Promising strains*
Faridkot	30s	FP. 575 and LH. 806
Hissar	30s	FP. 575, FP. 592, FP. 500, RS. 634 and H. 777
Sirsa	30s	BC. 69 and B.N.
Sriganganagar	30s	LH. 806, LH. 859, LH. 884, LH. 910, FP. 500, FP. 575, H. 934, H. 928, HS. 27, HS. 39, H. 936, CA. 7 and CA. 63

G. arboreum Trial

The main object of the Co-ordinated Varietal Trial (CVT) of **G. arboreum** is to identify short staple and very coarse (Micronaire value above 7.0) strains which are normally used along with man-made fibres for special purposes such as stuffing of mattresses, etc. The object of Preliminary Varietal Trial (PVT) of **G. arboreum** is to evolve high yielding, superior cottons for spinning coarse counts. The above trials were conducted at Bulandshahr, Hissar, Mathura, Sirsa and Sriganganagar.

The following strains have recorded Micronaire value over 7.0 in the Co-ordinated Varietal Trial :

Location		*Strains*
Bulandshahr	:	HD. 58
Hissar	:	LD. 205, LD. 230, LD. 224 and LD. 58
Mathura	:	LD. 11
Sirsa	:	HD. 31, DS. 1, DS. 2, LD. 205 and DS. 5
Sriganganagar	:	LD. 31

From spinning point of view, the following **abroreum** strains recorded desired yarn strength at 20s count :

Location		*Strains*
Hissar	:	HD. 40
Ludhiana	:	LD. 275, SD. 3, HD. 37 and HD. 40
Mathura	:	HD. 11 and HD. 31

Miscellaneous Trial

Attempt is being made at IARI New Delhi for the past 2-3 seasons to evolve high yielding superior Egyptian type cottons (**G. barbadense** species) having 150 to 160 days maturity period. The promising strains for 80s count were 199-6-12, 199-17-25-2 and 199-17-25-4.

CENTRAL ZONE

Madhya Pradesh, Gujarat and Maharashtra come under the Central Zone. This zone has the largest area under cotton cultivation. Although emphasis is given to improve the existing American type of cottons, i.e. **G. hirsutum** species, sizable percentage of cottons from **G. arboreum** species is also under cultivation, as most of the area especially in Madhya Pradesh and Maharashtra is under rainfed cultivation. For the last 10 years, Hybrid 4 has been widely accepted in all the three states; however, attempts are being made to identify early maturing hybrids without sacrificing the yield. Trials are also conducted for improvement in **G. herbaceum** cottons, the species which is traditionally grown in some pockets in the Gujarat State.

TABLE 4 : SUMMARY OF TEST RESULTS OF STRAINS TRIED IN CO-ORDINATED VARIETAL TRIAL (CVT) OF G. HIRSUTUM IN CENTRAL ZONE

Location	No. of samples	Range				Count Spun	Spinning performance		Control
		2.5% span length (mm)	Micronaire value (μg/in)	Maturity	Bundle strength (g/t)		A	B	
1	2	3	4	5	6	7	8	9	10
				Irrigated — Br04(a)					
Nagpur	14M	24.8—30.4 (27.3)	3.7—4.6 (4.0)	58—83 (71)	35.4—45.6 (40.4)	40s	7	4	G.Cot.10
Nanded	5M	24.3—32.8 (26.2)	3.2—4.0 (3.8)	59—77 (70)	35.9—46.1 (41.6)	50s	1	1	MCU.5
Surat	7F	23.8—28.3 (25.8)	3.4—4.4 (4.0)	57—77 (71)	38.6—44.5 (41.7)	50s	2	3	G.Cot.10
Talod	15M	25.0—32.7 (28.0)	4.7—5.1 (4.7)	68—85 (78)	43.4—50.9 (46.7)	50s	7	4	G.Cot.100
				Rainfed — Br04(b)					
Akola	6M	25.4—28.4 (26.9)	4.2—4.6 (4.4)	69—81 (75)	42.9—45.6 (44.3)	50s	1	4	L.147
Badnapur	4M	24.4—27.6 (26.2)	3.5—4.0 (3.8)	60—75 (68)	39.7—40.7 (40.4)	40s	—	—	—
Indore	10M	22.4—27.0 (24.4)	2.6—3.9 (3.0)	38—63 (51)	37.5—45.0 (42.3)	30s	9	7	Khandwa/2
Khandwa	9M	23.0—25.4 (24.2)	4.0—5.7 (4.5)	67—84 (77)	42.3—49.3 (46.6)	30s	6	4	68KH33/1146
Nagpur	8M	25.5—32.6 (27.9)	3.9—5.0 (4.2)	56—80 (71)	39.1—46.1 (43.2)	Material insufficient			

— Table Contd.

1	2	3	4	5	6	7	8	9	10
Nanded	6M	25.3—30.7 (27.3)	3.7—4.8 (4.2)	68—75 (72)	38.6—45.0 (42.2)	50s	4	4	SRT.1
Parbhani	5M	23.6—25.8 (24.4)	4.3—5.0 (4.7)	67—80 (75)	41.8—45.6 (43.7)	30s	—	—	—
			High Ginning Type — Br04(c)						
Akola	6M	25.9—29.8 (27.1)	3.9—4.5 (4.3)	65—81 (71)	38.1—45.6 (41.6)	50s	2	3	L.147
Indore	12M	23.1—26.2 (24.3)	below 2.4—3.0	36—54 (48)	37.5—46.6 (42.6)	30s	8	3	Khandwa 2
Khandwa	12M	21 8—28.0 (23.8)	3.8—4.9 (4.4)	65—86 (77)	42.9—51.5 (46.9)	30s	4	1	68KH33/1146
Nagpur	10M	24.4—31.9 (26.8)	3.7—5.4 (4.3)	54—82 (71)	38.6—45.6 (41.2)	40s	4	—	G Cot.10
Nanded	6M	23.3—28.0 (25 3)	3.4—4.7 (4.0)	58—77 (68)	37.5—45.0 (42.0)	40s	4	3	G.Cot.10
Surat	7F	23.6—28.2 (25.7)	3.8—5.0 (4.2)	59—75 (69)	38.1—44.0 (41.4)	50s	2	2	G.Cot.10
Udgir	6M	24.0—27.2 (25.6)	3.6—4.1 (3.8)	65—75 (69)	37.0—45 0 (40.5)	40s ...	3	1 ...	SRT.1

A . Samples spinnable to the count selected.

B : Samples having spinning performance on par or better than control.

M — Microspinning F — Full Spinning

Note : Values in brackets indicate averages.

G. hirsutum Trials

The Co-ordinated Varietal Trial was conducted under irrigated conditions at Nagpur, Nanded, Surat and Talod and under rainfed conditions at Akola, Badnapur, Indore, Khandwa, Nagpur, Nanded and Parbhani. Strains, specially identified for high ginning out-turn were received from Akola, Indore, Khandwa, Nagpur, Nanded, Surat and Udgir.

The ranges of 2.5% span length, Micronaire value, maturity and bundle strength along with the spinning potential have been compiled in Table 4.

Promising strains identified at different locations were as under :

Location	*Count*	*Promising strains*
		Irrigated
Nagpur	40s	G. 927, G. 2637, 66 BSTD, Kop. 495, JLM. 84, LRA. 5166 and G. Cot. 10
Nanded	50s	MCU. 5
Surat	50s	LRA. 5166 and G. Cot. 100
Talod	50s	66 BSTD, G. 925, G. Cot. 100, LRA. 5166, G. 2637, IAN. 2979, 761H. 20 and JLH. 84
		Rainfed
Akola	50s	LRA. 5166
Indore	30s	G. 13426, LRA. 5166, PKV0011-7, NH. 210, G. Cot. 10, 68 KH-33/1916, NH. 231, Khandwa 2 and VJJ IN
Khandwa	30s	G. 13426, LRA. 5166, PKV. 0011-7, G. Cot. 10, 68KH-33/1916 and 68KH. 33/1146
Nanded	50s	LRA. 5166, G. 13426, G. Cot. 10, and 66KH-33/1916

Location	*Count*	*Promising strains*
	High Ginning Type	
Akola	50s	NH. 235, AC. 938 and NH. 232
Indore	30s	PKV. 0830, NH. 239, G. 3080, NH. 232, G. Cot. 10, NH. 238, PKV. 0802 and Khandwa 2
Khandwa	30s	NH. 239, G. 3080, NH. 232 and 68 KH. 33/1146
Nagpur	40s	NH. 239, NH. 232, NH. 233 and and G. 3080
Nanded	40s	NH. 239, NH. 238, PKV. 0802, SRT. 1 and G. Cot. 10
Surat	50s	G. 3080 and G. Cot. 100
Udgir	40s	NH. 232, NH. 239 and SRT. 1

The Preliminary Varietal Trial was conducted under rainfed conditions at Akola, Khandwa, Nanded and Parbhani. This trial under irrigated conditions was conducted at Padegaon (North Zone entries) and Parbhani. Promising strains at different locations are given below :

Location	*Count*	*Promising strains*
Akola (R)	50s	IC-1225, 771H. 24, 71KH. 1910, CPH. 5138 and L. 147
Khandwa (R)	30s	PKV-0726, IC-1225, 771H-24, 71KH. 1910, 74IH. 9, KH. 21-1911 and CPH. 5138
Nanded (R)	40s	G. Cot. 10, 74IH. 9 and SRT. 1
Padegaon (I) (N. Zone entries)	40s	FP. 236, FP. 385, FP. 472, H. 843, H. 939, H. 894, LH. 808, LH. 845, RS. 510, RS. 603, RS. 606, RS. 610, RS. 1, SH. 2978, B.N. and Laxmi
Parbhani (I)	50s	G. Cot. 10, G. 10-M, LRA. 5166 and RHR. 402

R — Rainfed I — Irrigated

The Initial Evaluation Trial was conducted at Akola, Khandwa and Talod. The following strains have shown desired yarn strength for the counts indicated :

Location	*Count*	*Promising strains*
Akola	40s	ACH. 548, PH. 36, Pusa 31, G. 464 and L. 147 (Control)
Khandwa	40s	G. 12, G. 2482, G. 2419, NH. 255, NH. 194, NH. 202, PKV. 0808, PKV. 0724, IAN-75-15, 68KH33/1146 and G. Cot. 100 (Control).
Talod	50s	G. 2803, G. 1226, G. 2417 and G. Cot. 100 (Control)

G. barbadense Trial

A set of 5 samples with Suvin 62-17 as control was received from Surat. Range of 2.5% span length was between 27.1 mm and 35.7 mm. Micronaire values ranged between 3.4 and 4.3. Although bundle strength values were satisfactory, none of the strains recorded bundle strength as high as Suvin 67-17. Suvin 62-17 recorded spinning potential over 100 counts, while all other strains, viz. T. 9-77, G. 4-79, M. 4-4512 and ERB. 13758, showed spinning potential for only 50s count.

G. arboreum Trials

Co-ordinated Varietal Trial was conducted at Akola, Badnapur, Nanded, Parbhani, and Udgir. All the samples were spun to 20s count. The following samples fared well at the locations indicated :

Location	*Promising strains*
Akola	78IA. 1, AKH. 590, AKH. 606, AKA. 28, AKH. 597 and AKA. 5
Badnapur	PA. 32, AKH. 590, AKH. 607, AKH. 592 and AKA. 5
Nanded	AKH. 603, AKH. 607, NA. 48, NA. 39 and Eknath
Parbhani	JLH. 7, AKH. 5 and PA. 32
Udgir	AKH. 590, AKH. 606, AKH. 592, AKH. 607 and CJ. 73

In the Preliminary Varietal Trial conducted at Akola, the strains AKA. 14, AKA. 57, AKA. 13, 36-1 x 36-2 and AKA. 4 recorded desired yarn strength at 20s count. In the Initial Evaluation Trial conducted at Parbhani, six strains, viz. 79 PA. 18, NA. 78, NA. 65, NA. 80, PA. 32 and AKH. 4 were adjudged as promising for 20s count.

G. herbaceum Trials

Co-ordinated Varietal Trial under rainfed condition was conducted at Bharuch and Nagpur. In addition, this trial as well as Preliminary Varietal Trial were also conducted under irrigated conditions at Nagpur. The following strains fared well at 30s count :

Location	*Promising strains*
Bharuch (R)	5497
Nagpur (R)	1501, 1522, 1433, 6023, 404, 420, 2839, 3996-8, 4595-14 and G. Cot. 13
Nagpur (I)	3518

R — Rainfed *I — Irrigated*

Hybrid Trials

Hybrids involving **hirsutum-hirsutum** crosses were tried at Akola, Badnapur, Khandwa, Nagpur, Nanded, Parbhani, Surat and Udgir. The promising strains at the respective locations are listed out below :

Location	*Count*	*Promising strains*
Akola (I)	50s	ACHH. 3, IRH. 1-2, AHH. 68 and RHH. 401
Badnapur (R)	50s	GCH. 6, Hybrid 4 and Godavari
Khandwa (I)	40s	ACHH. 3, RHH. 401 and IRH. 1-2
Nagpur (I)	40s	ACHH. 3, ACHH. 16 and Hybrid 4
Nagpur (R)	40s	GHH. 15 and ACHH. 16
Nanded (R)	50s	PHH. 106, NHH. 255, GCH. 6 Godavari, GHH. 15 and ACHH. 3
Parbhani (I)	50s	NHH. 352, PHH. 112 and G. Cot. Hybrid 6
Surat (I)	50s	ACHH. 3, RHH. 401, Hybrid 4 and G. Cot. Hybrid 6
Udgir (R)	50s	AHH. 352

R — Rainfed *I — Irrigated*

In recent years, Hybrid 4 F1 seed is also being multiplied at the Agriculture Research Stations in Maharashtra. Comparative performance of the samples raised from Maharashtra seeds and those from Gujarat seeds was studied at Badnapur, Nanded and Parbhani.

The main fibre characters along with CSP values are reproduced below :

Place	Location of seed multiplication	2.5% Span Length (mm.)	Micronaire value (μg/in)	Bundle Strength (g/t)	Count	CSP
1	2	3	4	5	6	7
Badnapur (I)	Maharashtra	30.8	3.8	40.2	50s	2105
	Gujarat	**29.3**	3.7	39.7	50s	2005
Badnapur (R)	Maharashtra	28.8	3.4	40.7	50s	2205
	Gujarat	27.4	3.5	40.7	50s	2055
Nanded (R)	Maharashtra	30.3	4.2	41.3	60s	1950
	Gujarat	**29.2**	**4.2**	**40.2**	**60s**	**1896**
Parbhani (I)	Maharashtra	28.1	3.9	40.7	50s	1957
	Gujarat	**27.4**	4.0	43.4	50s	2175

R — Rainfed *I — Irrigated*

It may be seen from above that Hybrid 4 from Maharashtra recorded almost identical technological performance as that from Gujarat.

A set of 6 samples and another set of 3 samples involving **hirsutum-barbadense** crosses were received from Nagpur and Surat for Micro-spinning and Full spinning tests, respectively. Only one hybrid, viz. H. 64 from Nagpur and 3 hybrids, viz. Varalaxmi, RHB. 501 and RHB 502 fared well at 80s count.

Samples pertaining to **desi** hybrids were received from Akola under irrigated conditions and from Parbhani under rainfed conditions. Range of 2.5% span length of samples from Akola was between 23.4 mm and 31.8 mm. All the hybrids recorded excellent uniformity in staple with satisfactory maturity. They have recorded much lower Micronaire value (around 4.2) as compared to that of **arboreum** control (Micronaire value 5.1). Bundle strength values were satisfactory at both zero and 1/8″ gauge lengths. DH. 149 recorded highest CSP (2672) followed by NAA. 1 (2300), DH. 22 (2246) and DH. 2 (2178).

Fifteen new **desi** hybrids along with two controls **CJ. 73** and **PA. 32** were raised at Parbhani under rainfed conditions. The following hybrids fared well at 20s count :

PAA. 83, PAA. 77, PAA. 81, PAA. 112, PAA. 108, PAA. 152, PAA. 154, PAA. 155, PAA. 156, PAA. 158, PAA. 91, PAA. 97, PAA. 95 and PAA. 89.

SOUTH ZONE

Cottons belonging to **G. hirsutum** species cover a large area in this zone. Cottons from other species, viz. **G. arboreum, G. herbaceum** and **G. barbadense,** are also grown in some tracts of this zone.

G. hirsutum Trials

Co-ordinated Varietal Trial was conducted at Siruguppa under irrigated conditions and at Dharwad under rainfed conditions. Ranges of 2.5% Span length, Micronaire value and Bundle strength along with the spinnability are given in Table 5.

The promising strains from this trial from spinning point of view are given below :

Location	*Count*	*Promising strains*
Siruguppa (I)	40s	SRG. 584, DA. 70-480-2, SRG. 591, LAM. 65, ACP. 71-43-4, DS. 27, DIC. 13, DS. 56, AHO. 66-1071-1 and MCU. 5
Dharwad (R)	50s	BWR. 198, DP. 336, JK. 236-2, JK. 78-162, DP. 445, UAS. 484, DP. 984 and Laxmi

R — Rainfed *I — Irrigated*

Preliminary Varietal Trial was conducted at Siruguppa under irrigated conditions and at Dharwad and Kovilpatti under rainfed conditions. Strains which have shown desired yarn strength at respective counts were as follows :

TABLE 5: SUMMARY OF TEST RESULTS OF STRAINS TRIED IN CO-ORDINATED VARIETAL TRIAL (CVT) OF *G. HIRSUTUM* IN SOUTH ZONE

Location	No. of samples	Ranges				Count Spun	Spinning performance		Control
		2.5% span length (mm)	Micronaire value (μg/in)	Maturity	Bundle strength (g/t)		A	B	
1	2	3	4	5	6	7	8	9	10
Siruguppa (I)	15M	27.0—34.0 (29.5)	3.2—5.1 (4.1)	60—83 (73)	39.1—45.6 (42.3)	40s	8	8	MCU.5
Siruguppa (I)	6M	27.0—32.3 (28.7)	4.0—4.6 (4.3)	56—77 (67)	35.4—40.2 (38.2)	40s	2	4	MCU.7
Dharwad (R)	12M	21.9—29.9 (27.2)	3.0—3.8 (3.3)	47—70 (60)	37.0—45.0 (43.0)	50s	9	9	Laxmi

R — Rainfed *I — Irrigated* M — Microspinning

A : Samples spinnable to the count selected.

B : Samples having spinning performance on par or better than control.

Figures in brackets indicate averages.

Location	*Count*	*Promising strains*
Siruguppa (I)	30s	AHO.61-38-2, LAM. 65, AV. 3670, EL. 0787 B, BIC. 90, LS. 133-1, ACP. 71-14-1, TSA. 124, EL. 0668-D, ACP. 56-9-1, AV. 3326, AV. 3649, BJR. 97-16-4, TSH. 105-A, DIC. 57, ACP. 71-59-1, DIC. 83, IS. 184, RAS. 301 and MCU. 5
Dharwad	50s	MESR. 24, TKH. 27, MESR. 17, TKH. 26, JK. 285, DRC. 6, NA. 920, TKH. 22, DRC. 4, Laxmi, DP. 1773, NA. 886, NA. 777 and JK. 258
Kovilpatti	40s	TKH. 22 and KC. 2

Initial Evaluation Trial

This trial was conducted at Siruguppa under irrigated conditions and at Dharwad under rainfed conditions. The following strains fared well at the locations and counts indicated below :

Location	*Count*	*Promising strains*
Siruguppa (I)	40s	AV. 3069, MCU. 5, DIC. 29, AV. 3310, SRG. 629, DIC. 12, ACP.27-1/1, ACP. 71-59-1 and LPS. 35
Dharwad (R)	50s	DRC. 31, DRC. 91, DRC. 82, DRC. 50, DRC. 22, JK. 349, DRC. 29, DRC. 30, CC-III-15-2, DS-44-SB, CPD. 7-B-22, RRD-12-SB, CC-III-82-4, DRC-11 and Sharada
	40s	JK. 344, JK. 348, JK. 336, JK. 296, JK. 345, JK. 356, JK. 259, JK. 260, JK. 307, CPD. 112, CPD. 150, CPD. 152, Laxmi and Sharada

R — Rainfed *I — Irrigated*

G. barbadense Trials

Co-ordinated Varietal Trial, Preliminary Varietal Trial and Initial Evaluation Trial were conducted at Shimoga under irrigated conditions. The following strains from respective trials fared well at 80s count.

Trial	*Promising Strains*
CVT	Menoufi, BCS. 22-73 and Suvin
PVT	TCB. 15, BCS. 18-59-19, S.I. Andrews, BCS. 6-48, TCB. 14, RRB. 22-4, P. III. 10, BCS. 23-18-7 and Suvin
IET	BCS. 5-49, BCS. 9-95, BCS. 9-45, TCS 26-6 and BCS. 10-86-7

G. herbaceum Trials

Co-ordinated Varietal Trial, Preliminary Varietal Trial and Initial Evaluation Trial were conducted at Dharwad under rainfed conditions.

In the case of Co-ordinated Varietal Trial, none of the strains showed spinning potential of 30s count. However, as many as six strains recorded spinning potential on par with that of the control variety, Jayadhar. These strains were DB. 3-12-4, SM. 88, DB-3-12, DB. 3-12-8, MDS. 56 and 72-245.

In the Preliminary Varietal Trial, strains CPC. 5289, CPC. 5280, RDF. 7-3-12, CPC. 5288, DB. 3-12-6, R. 51, XHK. 86-3, CPC. 5285 and Jayadhar fared well at 30s count, while only two strains DB. 3-12-S-51 and DB 3-12-S-164 from the Initial Varietal Trial recorded promising performance at 30s count.

Hybrid Trials

Hybrid trials either intra-species or inter-species were conducted at Dharwad under rainfed conditions and Siruguppa under irrigated conditions. The promising hybrids were as follows :

Location	*Count*	*Promising hybrids*
Dharwad **(hirsutum x hirsutum)**	50s	DCH 397, LHH. 3, G. Cot. Hybrid 6 and Hybrid 4
Siruguppa **(hirsutum x barbadense)**	80s	NHB. 14, H. 64, LHB. 2, H. 144 and Varalaxmi

Miscellaneous Trials

In the Pilot Project Demonstration Trial of **G. hirsutum** conducted at Siruguppa under irrigated conditions, five strains, viz. DS. 40-480, SRG. 584, DS. 56, Sharada (CPD. 8-1) and MCU. 5 recorded promising performance at 40s count, while three strains, viz. DS. 44, DP. 225 and LRA. 5166 recorded desired CSP at 50s count in the same trial conducted at Dharwad under rainfed conditions.

In the Pilot Project Demonstration Trial pertaining to **G. herbaceum** species, DB. 3-12, 72-245, SM. 6 alongwith the control variety Jayadhar were found suitable for 20s count.

EXTRA LONG STAPLE COTTONS (27 mm and above)

Test results of extra-long staple cottons received as Trade Variety, Standard and Agricultural Cotton samples and tested during 1983 are given in Table 6.

MILL TEST

After careful consideration of the quality parameters of cotton strains at field trials as well as technological evaluation of them at CTRL, the promising varieties of cotton are being subjected to Mill Test to gauge their performance under mill conditions. The recommendation for large scale propogation of these improved strains will be generally made only after their performance at the mill conditions is confirmed. CTRL arranges mill tests with the co-operation of a few textile mills in the country.

During the year mill tests were arranged for samples received from Coimbatore, Kovilpatti and Nanded and the test results are reported in Table 7.

It may be seen from the Table that the strain Supriya raised under irrigated as well as rainfed conditions recorded satisfactory spinning performance for 40s count at the Mill and for 50s count at the Laboratory. The technological performance of the new strain K2HC from Kovilpatti was quite promising for the finer counts of 60s and above. Although the strain NH. 239 and NA. 48 from Nanded recorded identical performance with respect to yarn strength at the Mill, their performances were inferior compared to the controls SRT. 1 and Eknath, respectively.

NEW COTTON VARIETIES RECOMMENDED FOR RELEASE

DS. 1 DS. 1 is an early maturing type (170-180 days) **arboreum** strain evolved at Sirsa, Haryana by gamma-irradiation of the seed of the existing strain G. 27. It has a staple around 17.8 mm. with excellent length uniformity. Micronaire value is as high as 7.7. Its ginning out-turn is also high at 39%. Being resistant to diseases and insect pests, it requires less plant protection. It is also tolerant to

TABLE 6 : RESULTS OF EXTRA-LONG STAPLE (27mm AND ABOVE) COTTONS TESTED DURING 1983

Variety	Place	Mean Fibre length		Fineness		Mature fibre %	Bundle strength		
		mm	in.	Milli-tex	Micro-naire value (μg/in)		Tenacity zero gauge (g/t)	P.S.I. zero gauge (lb/mg)	Tenacity $\frac{1}{8}$" gauge (g/t)
GUJARAT									
1. Hybrid 4	Vadalai	28.0	1.10	157	4.0	67	45.6	8.5	27.0
2. Hybrid 6	Surat	27.2	1.07	138	4.0	74	47.2	9.4	27.2
3. Hybrid 4	Mandela	28.1	1.11	165	4.2	74	44.5	8.3	26.4
4. Varalaxmi	Idar	31.0	1.22	122	3.1	69	44.0	8.2	28.8
MADHYA PRADESH									
5. Varalaxmi	Khach Road	32.0	1.26	126	3.2	70	50.9	9.5	31.0
KARNATAKA									
6. DRC. 233	Dharwar	27.9	1.10	157	4.0	—	41.8	7.8	—
MAHARASHTRA									
7. MCU.5 WT	Jalgaon	27.9	1.10	126	3.2	—	47.2	8.8	—
TAMIL NADU									
8. MCU. 5	Kovilpatti	29.0	1.14	122	3.1	72	42.9	8.0	27.9

TABLE 7 : COMPARATIVE SPINNING TEST RESULTS AT MILL AND CTRL FOR THE YEAR 1983

Sr No.	Place	Variety	Mill Test Results				CTRL Test Results			
			Wastes %	Count	Lea strength (lb)	CSP	Wastes %	Count	Lea strength (lb)	CSP
1.	CICR, Coimbatore	Supriya (I)	NA	40s	51.9	2075	5.8	50s	44.0	2200
		Supriya (R)	NA	40s	53.4	2138	6.9	50s	45.6	2280
		MCU.5 (C)	NA	60s	35.1	2108	6.5	60s	40.6	2436
2.	Kovilpatti	K2HC	5.2	60s	55.6	3336	5.8	80s	31.9	2552
		MCU.7 (C)	Not received				NA	40s	56.5	2260
3.	Nanded	NH.239	1.18	30s	64.3	1929	1.30	30s	55.7	1671
		SRT.1 (C)	2.35	30s	60.1	1804	3.27	30s	68.2	2046
		NA.48	1.23	30s	51.9	1558	1.10	30s	55.7	1671
		Eknath (C)	1 53	30s	51.0	1530	1.45	30s	57.6	1728

I -- Irrigated R — Rainfed C — Control NA — Not available.

drought and water logging. It can not only be suitable for export but also be conveniently used for blending with man-made fibres.

TNB. 1 Identified at the Agricultural Research Station, Tamil Nadu Agricultural University, Coimbatore, this **barbadense** Egyptian type variety was released by the Government of Tamil Nadu for the irrigated tracts in the State and has long, fine and strong fibres which can produce finer yarn of 100s count.

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

Lint samples of fair average quality of the Major Varieties of Indian Cottons are being obtained for each season through the East India Cotton Association (EICA) Ltd., Bombay, and some regional cotton associations. Representative **Kapas** samples of these varieties are also procured from the State Departments of Agriculture for determination of ginning percentage. The fibre and spinning test results, ginning percentage and other test results on each variety of cotton are being published as technological circulars as early in the season as possible for information of cotton trade and industry. In all, 24 circulars were issued during 1983 which included one sample of 1981-82 season. The test results of all the trade varieties of 1981-82 season were compiled and published, as 'Technological Report on Trade Varieties of Indian Cottons, 1981-82 season".

Evaluation of the Quality of Standard Indian Cottons

To assess the seasonal fluctuations in the characteristics of Indian Cottons and to gauge the comparative superiority or otherwise of the newly evolved strains, a number of selected varieties of Indian cottons, called Standard Indian Cottons, are tested every year. These varieties are grown in Government farms or Cotton Research Stations under the supervision of Senior Cotton Scientists of Agricultural Universities, every year under identical conditions. Extensive fibre and spinning tests are regularly being done on such samples and the test results are published as technological circulars for information of cotton breeders and other research workers, as early in the season as possible. During 1983, 17 such circulars were issued. The results on samples of 1981-82 season were consolidated and published as 'Technological Report on Standard Indian Cottons, 1981-82 season.'

To Study the Quality of Cotton Lint Developed at Different Positions on the Plant in its Relation to the Time of Picking

Sixty cotton samples chosen have been tested for fibre properties like 2.5% span length, fineness, percentage of mature fibres and bundle strength. The lint has also been spun on the Shirley Miniature Spinning Plant at a nominal count of 40s and the CSP values examined. Main observations are given below :

G. Cot, 10 : 2.5% span length was found to be significant for different pickings.

First and second pickings were at par, as far as 2.5% span length is concerned.

	Pickings			
	P1	P2	P3	CD
2.5% Span Length (mm)	27.7	27.2	25.4	0.6

Significantly low Micronaire value was noticed for second and third pickings due to immaturity.

The percentage of mature fibres was significantly higher for the first picking :

	Pickings			
	P1	P2	P3	CD
Fineness (Micronaire Value)	4.4	4.2	4.2	0.1
Percentage Mature Fibres	67	60	59	5

Top bolls were more mature.

	Nodes			
	N1	N2	N3	CD
Percentage Mature Fibres	60	60	66	5

Fibre bundle strength values did not differ significantly with pickings.

Significantly higher CSP values at 40s count were noticed for first and second pickings.

	Pickings			
	P1	P2	P3	CD
CSP Values	1976	2076	1500	214

It may be inferred that shorter and immature fibres with low CSP values were realised for third picking of G. Cot, 10. The position of the boll on the plant did not seem to affect the fibre characters (except fibre maturity) and the CSP values.

G. Cot. 11 : The fibres of first picking were found significantly longer. The bottom bolls (between 0 to 6 nodes) were also found to have longer fibres.

	Pickings			
	P1	P2	P3	CD
2.5% Span Length	27.8	26.7	—	0.6

	Nodes			
	N1	N2	N3	CD
2.5% Span Length	27.7	27.3	26.7	0.7

Highly significant difference was observed between the fineness values of the fibres from the two pickings.

	Pickings			
	P1	P2	P3	CD
Fineness (Micronaire Value)	4.9	4.2	—	0.1

In the case of the percentage mature fibres, F value was found to be significant. But the actual critical difference of the mean values for the two pickings just falls short of critical difference.

	Pickings			
	P1	P2	P3	CD
Percentage Mature Fibre	71	66	—	5

The fibres from the first picking were stronger also.

	Pickings			
	P1	P2	P3	CD
Bundle Strength (g/t)	58.9	51.3	—	1.9

For bundle strength, the interaction between the pickings and the position of the boll on the stem was found to be significant.

	Nodes			
	N1	N2	N3	CD
P1	59.1	57.8	59.8	3.3
P2	51.9	52.9	48.9	—

Longer, more mature and stronger fibres were observed in the first picking of G. Cot. 11. Bottom bolls were found to possess longer fibres.

Identification of Cotton Varieties (Grown at Cotton Research Station, Surat) with Different Levels of Nep Content and Study of Varietal Variability and Inheritance of the Characteristics of Neppiness in Cotton

Analysis of variance indicated that contribution to variance due to parents and hybrids was highly significant. The parents versus hybrids was not significant which implied the absence of mean heterosis for this character. A comparison of the parental and F1 means showed that the mean values of majority of the hybrids lie much below the range of their parents indicating negative heterosis. Out of 28 hybrids, 16 showed negative heterosis. The intra-**barbadense** and **hirsutum** — **barbadense** crosses have given higher number of neps as compared to intra-**hirsutum** crosses. Lowest number of neps was observed in the cross Am. Nectariless X IAN followed by Laxmi X Am. Nectariless (2.9) and Laxmi X IAN 4903 (3.2). These values were lower than those of the respective parents. The extent of heterosis ranged from −5.4% (IAN 4903 x Gujarat 67) to + 8.3% (Gujarat 67 X Suvin). Considering low neppy parent as better parent — the extent of heterobeltious ranged from 55.56% (Laxmi X IAN 4903) to 182.76% (Gujarat 67 X SB. 289 E).

The additive genetic component (D) was significant. However, its value was much lower than the dominant components (H1 and H2), which reflected the dominant components of variance to be more

important. The potence ratio $\left(\frac{H1}{D}\right)^{0.5}$ was more than unity indicating over dominance to be operative for this character. The value of H2/4 H1 which shows the proportion of genes with positive and negative effects, was almost symmetrical. The ratio of the total number of dominant to recessive genes calculated as $\frac{(4\ DH1)^{0.5} + F}{(4\ DH1)^{0.5} - F}$ was also more than unity which suggests that there were more number of dominant genes than recessive genes. This was further confirmed by positive 'F' value. The heritability value in narrow sense was 36%, which fall in the range of high heritability.

Influence of Insecticide Treatments on the Quality of Cotton and Cotton Seed

During the period under report, 36 samples of Hybrid 4 cotton for the season 1981-82, pertaining to the Entomological Trial-I, 'Comparative Efficacy of Different Synthetic Pyrethroids for the Control of Boll Worms' and 24 samples pertaining to Entomological Trial-II to study 'Evaluation of Permethrin and Cypermethrin for the Control of Insect Pests on Hybrid 4 Cotton', were received from Gujarat Agricultural University, Surat. The samples were tested for 2.5% span length Uniformity Ratio, bundle tenacity at both zero and 3 mm gauge lengths, maturity coefficient and Micronaire value. The data on Ginning Percentage and yield were obtained from the Senior Cotton Scientist, Surat.

The statistical analysis of the data for Trial I revealed that all the treatments improved yield very significantly. Bundle tenacity at 3 mm gauge length and Micronaire fineness had improved significantly for all the treatments except permethrin (Ambush 20EC) and cypermethrin (cyambush 26EC).

The statistical analysis of the data for Trial II revealed that all the treatments improved yield very significantly. However, all the treatments except permethrin (Ambush 50EC at the rate of 100 gm/ai/ha) increased 2.5% span length, bundle tenacity at 3 mm gauge length and Micronaire fineness significantly as compared to control.

Ten cotton seed samples of Hybrid 4 for the season 1981-82 belonging to Trial-I were analysed for oil content. From the data it is observed that all the treatments increased oil content as compared to control. The treatment of cypermethrin (cyambush 25 EC 50 gm ai/ha) increased oil content to the maximum (25.4%), followed by cypermethrin (Ripcord 10 EC at the rate of 50 gm ai/ha) (20.5%) whereas increase in oil content (11.1%) over control was minimum in the case of Fenvalerate.

Design, Fabrication and Testing of Seed-Cotton Cleaner

The developmental work pertaining to the fabrication of seed-cotton cleaner was carried out to ensure smooth flow of seed-cotton during cleaning process, before carrying out the actual testing work.

A summary of the work carried out was as follows :

(1) Increase in the gap at the bottom of the seed-cotton hopper was made, to increase the intake of seed-cotton for obtaining the desired level of feed-rate.

(2) V-shape wire support for holding seed-cotton during peripheral beating of the spike roller was improved in order to avoid accumulation of seed-cotton on the support.

(3) Two additional spike rows on the spike roller were provided in order to increase the cleaning capacity.

(4) Arrangement was made to vary the gap between the saw roller and stripping plate, according to the size of the seed-cotton boll and/or the type of seed-cotton in order to extract the foreign materials at the two places on the saw roller.

Design and Fabrication of Cotton Boll Toughness Tester

During the period under report, a prototype of the tester was fabricated which could indicate the force required to pierce the boll, ranging from 0 to 400 g/mm^2. This range was found to cover all the types of cotton bolls. The tester consisted of a boll holder with which cotton bolls of any size could be suitably clamped and be oriented at any angle with the vertical so that the strength test could be made near any region on the boll. A standard 16 number sewing needle is pressed against the boll, the necessary tension being provided by a leaf spring. Provisions were made to move the boll against the needle when tension builds up in the leaf spring. The leaf spring was calibrated and could accommodate loads upto 500 g with a deflection of nearly 9 mm. The deflection of the spring was measured indirectly with the aid of a dial gauge attached to the boll holder.

Several cotton bolls have been investigated using the above tester. The tests include the boll-toughness index as well as the skein strength index measurement. The results showed that wide variation existed among different varieties of cotton bolls. Within the same variety, there appeared a central tendency signifying the varietal characteristics, dependent only on the genetic nature of the cotton. More work

on this aspect was contemplated covering other varieties of cottons. The experimental work was carried out in Gujarat Agricultural University, Anand.

Design and Fabrication of an Optical Scanning Fibre Length Tester

All the respective sub-assemblies were mounted in the mechanical housing and inter-assembly wiring was done. Front-panel digital meters were designed to $3\frac{1}{2}$ digit accuracy and mounted on front panel with all other control knobs and accessories with necessary inter connects. The electronic system was checked for optical balance, i.e. zero balance, and was made reasonably stable to an accuracy of ± 10 mm. Also good stability, repeatability and appreciable accuracy were obtained for sample size measurements.

The qualitative testing was done on the fabricated optical fibre length scanner using various long, medium and short staple varieties of cottons and the results were found to be well within the acceptable limits of accuracy. The instrument roughly consumes 95 watts of power and operates on AC power of 230 V ± 10% with 50 HZ frequency.

Relationship between X-Ray Orientation and Tensile Properties of Cotton Fibres

As envisaged last year, a study has been undertaken during the year to verify the discrepancies in the observations reported in the article on a similar study conducted elsewhere. As the chief difference was the method of calculation of Hermans Orientation factor, eight cottons two each from each species were chosen from the 80 cottons studied earlier. The Hermans Orientation factor (fx) was calculated using 002 plane alone as was done in a study at CTRL as well as using 101, $10\bar{1}$ and 002. The results showed that the difference in fx values were within the range of experimental errors.

It was reported earlier that Strength Uniformity Ratio showed the same trend of correlation with different orientation parameters as elongation percentage. When the relationship between the two fibre properties was examined, it was found that the properties are significantly correlated for the 80 cottons studied. This may explain the identical trends of results mentioned earlier.

Studies on the Inheritance of Strength and Structural Parameters on Cotton Fibres

The F_1 hybrids from the chosen parent samples were raised. Ginning of the **kapas** was in progress.

X-Ray Diffraction Studies on Structural Parameters of Yarns with a View to Utilising them for Textile Yarn Characterization

The tenacity and breaking extension values of yarns from Suvin cotton spun to 20s, 40s, 60s, 80s and 100s, each with different TMs, were determined. For finer counts (60s to 100s) the 50% X-ray angle, ψ obtained from yarn orientation profiles was found to correlate well with yarn elongation ($r = 0.89$). With yarn tenacity, the relationship was poorer ($r = 0.57$).

The maximum twist angle α calculated using the data on TM and counts, was observed to be linearly associated with ψ. For larger values of α, ψ was found to be depend on the count of the yarn.

Cotton Fibre Strength and its Dependence on Various Morphological and Structural Parameters

Single fibre linear density by vibroscopy and breaking strength and extension were measured using Instron for four varieties of cotton taking at least 300 fibres from each. The varieties selected were : (i) Sea Island (**G. barbadense**), (ii) Badnawar 1 (**G. hirsutum**), (iii) Jayadhar (**G. herbaceum**) and (iv) Westerns (**G. herbaceum**). The two broken ends of the fibres were also examined under polarised light to ascertain whether break occurred near a reversal and also to measure the distance between the point of break and nearest reversal on both the broken ends. Because of certain difficulties in mounting and observation, the microscopic observations on broken ends could be made only for about 210 fibres out of the 300 odd fibres taken for tensile tests from each cotton.

Information on the average distance and distance between reversals at the point of break for the 4 varieties is given in Table 8.

TABLE 8 : AVERAGE DISTANCE AND DISTANCE BETWEEN REVERSALS AT THE POINT OF BREAK

Variety	Av. No. of reversals per cm.	Av. distance between reversals (mm)	Distance between reversals at break (mm)
Sea Island	24	0.41	0.45
Badnawar 1	31	0 32	0.49
Jayadhar	12	0.83	1.23
Westerns	15	0.65	0.84

The main feature noticed from the above data is that fibre rupture occurs at a point in the segment of the fibre where the reversals are spaced wider apart as compared to the average distance between the reversals.

Following the procedure adopted in earlier reports, fibres were grouped according to whether the breaks occurred near a reversal (distance of reversal from rupture point $\leqslant 100\,\mu$) or away from it. In the present report, a further sub-division has been made in the former group segregating the fibres that broke at a distance $\leqslant 30\,\mu$ from a reversal. The tensile properties of fibres grouped into different categories of breaks as mentioned above are given in Table 9.

It is observed that every fifth fibre among the fibres in each variety break within a distance of $30\,\mu$ from a reversal during the tensile test. When the distance limit is relaxed to $100\,\mu$, the corresponding fibre number increases to about 2/3 of the total in each variety. It is thus, evident that fibre rupture near the reversal is a significant event. However, corresponding differences in either tenacity or extention at break are not observed for fibres showing the 3 categories of break.

Studies on the Fracture of Cotton Fibres

Fractured fibres for SEM observations were selected after carrying out single fibre linear density (ld) and strength tests. The fibres were taken from 3 varieties, viz. Jayadhar, Westerns and Sea Island. The selection of fibres for SEM observations was based on their ld and breaking strength. About 4 fibres were chosen from each of the following categories :

(i) very low ld (immature fibres) and low strength,
(ii) average ld and average strength,
(iii) high ld and low strength, and
(iv) high ld and high strength.

The two fractured ends of each fibre were scanned separately and photographs were recorded in segments so as to cover the required fibre length near the fractured end under desired magnification. Several photographs were thus, necessary to capture all details of fractured ends. Some of the observed details of fracture and gross morphology of fibres from different varieties are given below :

1. It was possible to identify the position of a structural reversal in most of the fibres on the basis of surface details and change in the direction of convolutions.

TABLE 9 : TENSILE PROPERTIES OF FIBRES SHOWING DIFFERENT CATEGORIES OF BREAK

Variety	Tensile properties									Average of tenacity and extension values	
	At reversal (30 μ)			Near reversal (30-100 μ)			Away from reversal				
	Tenacity (g/t)	Extn. (%)	Percentage of fibres	Tenacity (g/t)	Extn. (%)	Percentage of fibres	Tenacity (g/t)	Extn. (%)	Percentage of fibres	Tenacity (g/t)	Extn. (%)
Sea Island	31.4	12.1	28	30.3	11.0	35.0	29.3	11.3	37	30.1	11.2
Badnawar 1	25.8	6.8	20	25.4	6.6	45.0	24.0	6.4	35	25.4	6.6
Jayadhar	23.6	5.7	17	23.4	5.6	37.0	21.9	5.4	46	22.8	5.6
Westerns	21.0	5.7	21	20.7	5.8	42.0	19.0	5.6	37	19.8	5.8

2. Immature fibres showed a sharp break. The rupture point in these fibres was not confined to the specific positions like reversals or convolutions, but was confined to other regions characterised by variation in cross-sectional shape or lateral dimensions.

3. Fibres with average ld and strength exhibited two kinds of breaks, viz. (i) sharp break and (ñ) long break, i.e. rupture with extensive fibrillation. The first kind of break was observed in fibres possessing a circular/near circular cross-section. Long fracture, on the other hand, was observed in the case of fibres having a collapsed section. It may be mentioned that the breaking strength of fibres having a circular or near circular cross-section was higher as compared to that of the collapsed fibres.

4. Fibres having high ld, but possessing low strength also showed both kinds of breaks mentioned above. A notable feature of these fibres was that none of them possessed circular cross-section but a collapsed structure with a comparatively large perimeter. It was observed that fracture occurred in these fibres at positions characterised by a sharp bend, highly varying section or sudden twist in the fibre. Some of the fibres were also observed to possess a typical cross-section, near the rupture point which may be called a 'node'. The node was probably formed during dehydration of the fibre at a point where the phase of a progressing convolution abruptly changes.

   The fracture point of fibres having high ld and high strength was marked by the absence of the irregularity features mentioned above.

5. In most of the fractured fibres, fibrils and lamellae were seen to be torn apart only in the 'neutral zone' of the fibre section. This confirms that the neutral zones in the fibre section are less densely packed (and more accessible too). Fibres with circular cross-section where the neutral zone is absent, showed mostly sharp breaks.

A Study of the Birefringence of Cellulose Films

Commercial cellophane film (20 μ thick) was subjected to swelling and stretching treatments in alkali by a procedure evolved earlier. Samples stretched by predetermined levels upto 42.5% above the initial length were prepared in this manner.

Birefringence in three principal directions was determined by the compensator method on film specimens cut into narrow strips by a method standardised at CTRL. Crystallinity and crystallite dimensions were determined by X-ray diffraction adopting standard methods.

Table 10 gives the values of birefringence (a-b), (b-c) and (a-c) measured in the three principal directions, where a, b and c are refractive indices in the respective directions.

TABLE 10: BIREFRINGENCE IN THREE ORTHOGONAL DIRECTIONS IN CELLULOSE FILMS SUBJECTED TO STRETCH

Sample	Birefringence in three directions (X 10^{-4})		
	a — b	a — c	b — c
Cellulose film : raw	110	145	44
Slack treated film	140	200	51
Stretched films :			
7.5% stretch	208	222	20
12.5% ,,	272	270	—
22.5% ,,	300	286	—15
27.5% ,,	307	302	—13
32.5% ,,	320	305	—20
42.5% ,,	341	310	—41

The quantities (a-b) and (a-c) reflect the orientation of the molecular axis parallel to the stretch direction and their inequality shows that the orientation is biaxial. Since, for the first few samples, (a-c) > (a-b), the glucose rings must be predominently parallel to the film surface. For latter samples, the reverse is true and hence it can be presumed that in these samples, the glucose rings are aligned preferentially, normal to the film surface. Earlier, X-ray studies elsewhere have established that the glucose rings in the crystalline phase are nearly normal to the film surface. From these two results, it can be deduced that the amorphous chains are aligned with the plane of glucose rings parallel to the film surface and that the increase in crystallinity resulting from stretch would increase the net number of molecular segments having glucose ring plane normal to the film surface. As stretching proceeds, crystallisation continues and more and more glucose rings tend to become normal to the film surface.

Crystallite width data (Table 11) show that among the three lateral dimensions, D_{101} is the lowest. The behaviour of the crystallites seems to be similar to the orienting tendency of air assembly of laminates inside an enclosure. This observation explains why the (101) plane tends to align itself parallel to the film surface.

TABLE 11: CRYSTALLINITY INDICES AND CRYSTALLITE DIMENSIONS OF STRETCHED CELLULOSE FILMS

Sample	Crystallinity Index		Crystallite width D_{hkl} (A)		
	Segal's	Inger-soll's	(101)	(10$\bar{1}$)	(002)
Cellulose film — raw	0.24	0.38	26.0	—	—
Slack treated film	0.22	0.35	39.0	—	—
Stretched films :					
12.5 stretch	0.29	0.43	38.0	41.3	40.05
22.5% ,,	0.32	0.44	39.0	39.3	35.2
32.5% ,,	0.31	0.50	34.0	39.3	34.0
37.5% ,,	0.35	0.57	33.0	42.4	43.0

Some Studies on the Swelling of Regenerated Cellulose Fibres in Sodium Hydroxide

Crystallinity, crystallite orientation, birefringence, moisture sorption and fluidity in cuprammonium hydroxide solution were determined on a set of rayon filaments subjected to swelling and stretching treatments by the procedure discussed in earlier reports. While crystallinity and crystallite orientation were determined by X-ray diffraction, birefringence was determined by the Becke line method. The results of various determinations are given in Table 12.

Considerable increase in crystallite orientation factor, crystallinity and birefringence has been found to occur during stretch, though there is an initial fall in these quantities with slack treatment. Stretch evidently helps crystallisation and molecular orientation towards the direction of the fibre axis. There is a small but significant fall in moisture regain on account of the increase in crystallinity during stretch. The fluidity is almost unchanged, signifying that the treatment does not involve any degradation.

TABLE 12: SOME STRUCTURAL AND PHYSICAL PROPERTIES OF SWOLLEN AND STRETCHED VISCOSE RAYON FILAMENTS

	Crystalline fraction	X-ray orientation factor (fx)	Crystallite Width Dhkl(A°)			Birefringence	Fluidity (Rhes)	Moisture regain (%)
			101	$10\bar{1}$	002			
1. Untreated rayon	0.35	0.81	40	—	—	0.029	11.4	14.6
2. Sample No. 1 treated slack in NaOH	0.35	0.77	35	46	41	0.020	11.1	14 2
3. Sample No. 1 treated in NaOH and stretched								
a) 0% stretch	0.41	0.79	39	49	38	0.024	—	13.7
b) 10% „	0.44	0.80	—	—	—	0.028	11.7	13.9
c) 20% „	0.45	0.83	—	—	—	0.030	10.6	14.1
d) 30% „	0.52	0.83	43	47	37	0.033	10.9	13.2
e) 40% „	0.49	0.83	—	—	—	0.035	10.9	13.6
f) 50% „	0.52	0.86	—	—	—	0.039	10.9	13.0
g) 55% „	0.57	0.89	43	54	39	0.039	10.7	13.4

Formulation of Suitable Indicies of Fibre and Yarn Quality for Assessing the Spinning Potential of Cotton

As mentioned in the last report, on the basis of the analysis of CSP and fibre test data for two lots of 50 and 35 cottons, the regression equation CSP = 12 ($\sqrt{FQI}$ + 120) and the range of $\sqrt{FQI}$, and FQI, corresponding to optimum CSP for each count, were fixed.

With a view to confirm the applicability of the formula and range fixed, 25 cottons covering a wide range of staple length were chosen and tested for Digital Fibrograph parameters, viz. 2.5% span length, 50% span length and weight of the fibre beard and bundle strength at 1/8″ gauge length. In addition, these samples were also tested for Baer Sorter parameters, viz. effective length, mean length and the weight of the fibres in the pattern, to examine whether these could replace Digital Fibrograph parameters for computation of FQI for assessing the spinning potential. From the various fibre quality parameters, FQI and $\sqrt{FQI}$ were computed separately for Digital Fibrograph and Baer Sorter which are denoted as I_1 and I_2, respectively. Each cotton was spun to two suitable counts and yarns tested for lea strength and CSP_1 and CSP_2 were calculated. The correlation coefficients between I_1, I_2 and CSP_1, CSP_2 were worked out and the values are given below :

r I_1. CSP_1	= + 0.7907**	r I_2. CSP_1	= + 0.5025**
r I_1. CSP_2	= + 0.8502**	r I_2. CSP_2	= + 0.5086**

It will be seen from the values that FQI computed from Digital Fibrograph parameters is better associated with CSP values than that determined using Baer Sorter parameters, although all the correlation values are highly significant. The results show that use of Baer Sorter length parameters for FQI determination may not give satisfactory estimation of spinning performance as compared to Digital Fibrograph parameters.

The correlation coefficient values for FQI computed for Digital Fibrograph parameters are in agreement with the results reported earlier.

A Review of the Studies on the Statistical Relationships between Fibre Properties, Spinning Performance and Yarn Characteristics

Literature survey is being carried out. The journal of the Textile Institute — Abstract for the years 1955 to 1968 and the World Textile Abstracts for the years 1969 to 1980 were surveyed for suitable refer-

ences. One hundred and forty six references concerning statistical relationships between fibre, spinning and yarn properties were noted for detailed study. From these twenty-eight papers that have appeared in the JTI, TRJ, ICGR and ECGR between the years 1955 and 1960, have been read in detail and abstracted for later reference.

Influence of Fibre Length and Fibre Length Distribution Parameters on Yarn Quality

It was observed earlier that the floating fibre index (FFI) at 12.5% span length (SL) had better association with the U% than FFI at 50% SL for 10 cottons ranging in 2.5% span length from 0.09″ to 1.42″.

For further study, 15 cottons were selected with 2.5% SL ranging from 0.80″ to 1.37″. The SL at 2.5%, 12.5%, 50% and 66.7% were determined.

In addition, short fibre content (SFC) was also calculated using the formula :

$$SFC = 3914 + [1.3 \times 2.5\% \text{ SL (mm)}] - [4.6 \times 50\% \text{ SL (mm)}].$$

Out of these 15 cottons, five short staple cottons (2.5% SL : 0.80″—0.89″) were spun to 20s count, the five medium staple cottons (2.5% SL : 0.98″—1.10″) were spun to 40s count and the last five long staple cottons (2.5% SL : 1.19″—1.37″) were spun to 60s count using conventional process of spinning. Yarns of these 15 cottons were tested on Uster Evenness Tester for U% and Imperfections (Thick + Thin places + Neps). A significant relationship was observed between the UR, FFI at 12.5%, 50% and U% for short satple cottons. In the case of long staple cottons, all length distribution parameters had significant relationship with the values of imperfections. The overall correlation for 15 cottons between SFC and U% was significant ($r = -0.90$). Compared to all other length distribution parameters, UR had better relationship with imperfections ($r = -0.66$).

Study of Inverse Relaxation/Stress Recovery Property of Cotton and Other Textile Fibres

Tests on polyester fibres at various levels of retraction corresponding to 10%, 15% and 20% extension levels were carried out. This showed the same type of behaviour as that observed for yarns. For ramie single fibres, experimental work at 3% and 4% extension levels and different retraction levels is completed. Analysis of the data is in progress.

Studies on Lakshmi-Rieter Drawing and Speed Frame

During the period, Varalaxmi cotton was processed through blow-room and card. The carded slivers were then processed on Lakshmi-Rieter drawing frame with an optimum setting of 39 mm front zone and 44 mm back zone with a break draft of 1.7 for the first passage and 1.3 for the second passage.

Two sets of rovings were prepared from the finisher head using the following setting and break draft.

Set I	*Back roller setting — 44 mm*	
C. F. 1	Break draft	1.21
C. F. 2	,,	1.52
C. F. 3	,,	1.76
Set II	*Back roller setting — 36 mm*	
C. F. 4	Break draft	—1.21
C. F. 5	,,	1.52
C. F. 6	,,	1.76

The rovings of the various combinations were then spun to 80s count yarn on Lakshmi Rieter ring frame.

U% of intermediate processes along with yarn characteristics were determined for all the combinations.

Optimal Blending of Standard Varieties of Indian Cottons

The spinning of 197/3 (Jalna), Virnar (Pandharpur) and AK. 235 (Akola) (Code Nos. C1, C2, and C3) was completed. The processing of a 50 kg. lot of G. 6 (C4) was then started and completed. The spinning was done separately on Laxmi Rieter and SKF drafting systems on the ring frame as well as on the Open End Spintrainer. While C1 could be spun only to 12s and 16s, the other three were spun to 16s to 20s in addition to 12s counts.

On the basis of yarn properties of the four individual cottons, Virnar, AK. 235, and G. 6 were selected for further studies on them in blends.

The following 3 blends were prepared :

Blend No.	*Cottons (%)*		
	Virnar	*AK. 235*	*G. 6*
C5	50	30	20
C6	20	50	30
C7	30	20	50

70 kg. lots of the above 3 blends were subjected to identical preparatory processes and spun to 16s and 20s count. In the ring spinning method, both LR and SKF drafting systems were tried. They were also spun on the Rieter Open-End Spintrainer.

The yarn properties of the blends are given in Table 13.

The ring spun yarns did not show any difference in CSP in the case of 20s count. As regards 16s count, C5 and C7 have slightly higher CSP than C6. For both the counts, C7 yarns have better evenness values than the other 2 blends.

No appreciable difference is however, noticed in the case of the open end spun yarn.

Studies on Optimal Blending of Standard Varieties of Cottons of Gujarat Region

Six varieties of Gujarat cottons, viz. Varalaxmi, Sankar 4, 170 CO_2, Digvijay, SRT. 1, C.J. 73 have so far been obtained. One bale each of 170 CO_2 has been obtained from Dharangdra and Nabipur areas.

The individual evaluation of each of the cottons has been taken up first. 100 kg. lots of 170 CO_2 from the two separate regions were processed.

The sample from Dharangdra has been spun to 16s and 20s counts on the ring frame. The yarn tests are in progress.

Study of Uniformity of Blend Composition in Cotton/Polyester Blends

Short range variations, occurring at intervals of the order of fibre length, have been measured by the microscopic method for four differently spun yarns. Specimens of sections for short range variation study

TABLE 13 : PROPERTIES OF YARNS SPUN FROM BLENDS OF VIRNAR, AK. 235 AND G. 6

Blend Code No.		C5			C6			C7		
Parameters Evaluated / Composition		Virnar 50%	AK. 235 30%	G.6 20%	Virnar 20%	AK. 235 50%	G.6 30%	Virnar 30%	AK. 235 20%	G.6 50%
	Spinning system	Ring		O.E.	Ring		O.E.	Ring		O.E.
Corrected CSP	16s	1999		1691	1934		1696	2029		1697
	20s	1889		1609	1851		1576	1874		1612
Single yarn Tenacity (g/t)	16s	10.8		9.7	11.6		9.9	12.5		10.1
	20s	10.9		9.9	11.8		9.7	11.1		9.7
Breaking Elongation (%)	16s	5.7		8.1	6.4		8.3	6.4		8.1
	20s	5.8		8.6	5.9		8.5	5.8		8.8
U%	16s	14.8		12.6	15.1		12.2	14.4		11.8
	20s	17.1		11.6	16.0		12.5	15.2		11.9
Neps/1.00M	16s	21		4	29		19	30		17
	20s	36		17	41		24	41		20
Yarn appearance	16s	B		D	B		B	+C		+B
	20s	C		+B	B		+B	B		+B

were from yarn segments of length very nearly equal to the fibre length, taken out continuously from a lea. On an average, two sections from each segment were examined and these two sections of each segment were separated from the corresponding section of the continuous segment by a distance approximately equal to the fibre length. For each blend, 20-25 such sections were examined and the blend composition was worked out in each case, after taking into account the linear density of the component fibres.

Table 14 shows the average values of blend compositions along with CV% for four differently spun viscose/polyester yarns tested for the short range variations. Sample No. 1 and 2 are spun from fibres of polyester and viscose having the same denier and staple length (38 mm), while sample No. 3 is spun with fibres having different staple lengths (44 mm and 51 mm) and deniers. Sample No. 4 is spun with fibres having same denier but longer staple length than those for samples 1 and 2.

TABIE 14: AVERAGE BLEND COMPOSITION AND CV% FOR SHORT RANGE VARIATION TESTS IN POLYESTER/VISCOSE BLENDED YARNS [% Polyster = 15 for sample No. 1, 2 and 3 while % Polyester = 48 for sample No. 4]

	Original Material		Flat Strips	
Parameters evaluated	Sample No. 1 (R)	Sample No. 2 (O.E.)	Sample No. 3 (O.E.)	Sample No. 4 (O.E.)
Average	13.3	14.5	12.1	47.9
C.V.%	16.4	13.3	28.8	6.5

R = Ring spun; O.E. = Open End.

It was interesting to note that the average in all cases was very close to the nominal value, though the individual variations (not shown in Table 14) were quite higher than ± 3% (allowed range of variation). The CV% was the least for sample No. 4 where the components had the same denier and staple length, and the highest for sample No. 3 which had component fibres of unequal deniers and staple strength.

The study of medium range variations by the standardised ir technique has been completed for samples No. 3 and No. 4. Table 15 gives the averages and CV% obtained in the study of medium range variation.

TABLE 15: AVERAGE BLEND COMPOSITION AND CV% FOR MEDIUM RANGE VARIATION TESTS ON POLYESTER/VISCOSE BLENDED YARNS [Sample No. 3 — Nominal 15/85; Sample No. 4 — Nominal 48/52]

Parameters evaluated	Flat Strips	
	Sample No. 3 (O.E.)	Sample No. 4 (O E.)
Average	12.9	48.2
C.V. %	5.9	3.6

Individual test values (not shown in Table 15) in that case never exceeded ± 3% of the actual blend composition. Unequal lengths and deniers for the component fibres used in blending did not have any significant effect on the medium range variation unlike in the case of short range variation.

Studies on the Effect of Swelling Treatments on Yarn Irregularity with Special Reference to Uster Evenness Value (U%)

The main object of this investigation was to study the causes of changes in Uster value of yarns after they are treated with swelling agents. During the period, two yarn samples of 10s and 20s count in hank form stretched to original length were treated with two different swelling agents, viz. NaOH and KOH, using wetting agent. After dewaxing separately with 10%, 20%, 30% and 40% concentrations, washed and dried, the samples were tested for U% on Uster Evenness Tester and the results were reported in Table 16.

It may be seen that as compared to control, U% for treated samples was higher for both the counts for all the concentrations of NaOH as well as KOH (irrespective of whether dewaxed or using wetting agent). However, there was no systematic trend of change in U% with increase in the concentration of alkali. In general, increase in U% was slightly higher for KOH treatment compared to that for treatment in the corresponding NaOH concentration.

The trends observed in the case of the above samples are not in agreement with the results pertaining to earlier samples. It was reported that U% had increased for the samples mercerised with wetting agent, whereas there was practically no change in U% for kier-boiled and mercerised samples. It is therefore, proposed to examine the changes in fibre circularity brought about on treatment with the two swelling agents by different techniques.

TABLE 16: U% VALUES FOR THE SAMPLES TREATED WITH DIFFERENT CONCENTRATIONS OF SWELLING AGENTS

Concentrations (%)	NaOH				KOH			
	Wetting Agent		Dewaxed		Wetting Agent		Dewaxed	
	10s	20s	10s	20s	10s	20s	10s	20s
Grey (c)	15.6	15.7	15.6	15.7	15.6	15.7	15.6	15.7
0 (wet)	16.4	16.4	15.9	16.5	14.2	15.3	15.3	14.8
10 (st)	19.0	17.7	16.0	17.9	21.4	16.3	16.1	17.1
20 (st)	16.7	16.3	20.4	17.2	18.8	17.3	19.8	17.3
30 (st)	17.0	16.5	17.0	16.6	21.2	17.1	19.8	17.6
40 (st)	19.3	17.2	17.3	16.3	19.1	18.6	17.5	18.7
30 (sl)	15.0	16.6	17.1	18.2	—	—	—	—
50 (st)	—	—	—	—	17.2	18.3	17.0	18.0

st — Mercerised and stretched to original length

sl — Mercerised slack

Pilling Behaviour of Textile Fabrics

With a view to compare the results of pill formation on synthetic blended fabrics by using the Martindale Wear Tester and Tumbling Pill Tester, the methods of test on Martindale Wear Tester in respect of the duration of rubbing and the choice of abradant were to be standardised.

There are three known abradants suggested in the literature, viz. (1) '0' Emery Paper (2) Cloth against Cloth (3) Canvas against Cloth. Experiments were conducted on three samples of blended fabrics by using these three abradants and it was observed that the use of canvas as an abradant gives better idea of pill formation.

With regard to the standardisation of timing required for the pill formation, the effect of the number of rubs ranging from 500 to 10,000 was studied on a few samples of Polyester/Cotton and Polyester/Wool blended fabrics.

A graph showing the number of pills formed against the number of rubs was plotted in each case. It was observed that the maximum number of pill formation was between 2,000 and 3,000 rubs, though in some cases the plateau extended even beyond 3,000 rubs. Therefore the number of pills formed showed a decreasing trend evidently because of the fact that subsequent rubbings dislodged the pills already formed. The work of identification of fibres used in the blended fabrics and their quantification has also been taken up.

Fifteen blended and knitted fabrics will be selected and tests on them conducted for pill formation on the Martindale Wear Tester by using canvas as the abradant and 3,000 rubbs as optimum limit for pill formation. The test would also be carried out on the Tumbling Pill Tester as soon as the latter is received at CTRL.

Studies on Grafting of Vinyl Monomers onto Cotton Fabric

A new technique was developed to obtain higher graft percentage with methyl methacrylate, keeping cotton monomer ratio 1:1. Required amount of freshly distilled monomer was taken in acetone. The fabric fixed on the frame was dipped in the monomer solution taken in a stainless steel tray. 0.005 molar solution of ceric ammonium nitrate M:L ratio 1:50) was added and the reaction allowed to continue for specified time. The fabric was then removed from the reaction bath and washed thoroughly with soap water. It was then extracted with

acetone in a soxhlet extractor for six hours to remove any homopolymer. The grafting was uniform and percent graft varied from 2% to 25%.

Using the above technique, acrylonitrile was grafted on to cotton fabric. Fabric samples with 1% to 13% graft were obtained under different experimental conditions. However, in the case of styrene, maximum percent graft obtained was only 2, by the above method. The method therefore is being suitably modified to obtain higher percent graft with styrene. The grafted fabrics were being evaluated for various properties.

Response of Cottons to Preswelling and Crosslinking Treatment — Influence of Ultra-fine Structure on Mechanical Properties of Treated Cottons

Fourteen Indian cottons were given crosslinking treatment to evaluate their response to chemical finishing treatments. Some cottons, viz. AKH. 4, Digvijay, Suyodhar and V. 797 exhibited good retention of tenacity and elongation after the crosslinking treatment. 16 cottons received from Crop Development Division, CICR, Nagpur were screened for response to easy-care finishing treatment. Some of the strains viz. T_3-11, K. 41, K. 44 and K. 46 were found to have good retention of tenacity and elongation.

Satin fabric treated with 4%, 8%, 10% 12%, 15% and 20% DMDHEU, were evaluated for CRA and DP rating. A short note relating CRA with DP has been prepared based on the result obtained on Drill, Poplin, Sheeting and Satin fabrics which were treated with different concentrations of DMDHEU.

Convolution angle and number of convolutions and reversals were determined on five cottons.

Durable Flame Retardant (FR) Finishes for Textiles

Various trials were carried out to improve wash fastness of phosphorylated FR treated cotton fabrics, and treatment with a new polymer reagent 'P' was found to be promosing. More trials were carried out on cotton fabrics using this treatment.

Various types of fabrics were received from M/s. Raghuram Textiles to impart FR finish. The fabrics — (1) heavy Harringbone (2) heavy casement (3) heavy matty, and (4) striped fabric of different colours,

were treated by process using polymer reagent 'P' to impart FR finish. It was interesting to note that these treated fabrics retained 98% strength. The Doordarshan (Television) authorities have prepared a short TVNF film on this project along with some other items of achievements of the Laboratory.

Study on Cotton and Cotton Blended Fabrics Treated with Mixtures of Resin

During the period under report, scoured, bleached and mercerised cotton poplin fabric samples were crosslinked with 10% DMDHEU in the presence of a mixed catalyst system and other additives such as 2% solution of polyethylene emulsion as softener and 0.1% of a wetting agent. The mixed catalyst system was used in varying proportions of catalyst keeping the total concentrations of catalysts ranging from 0.5% to 3.5%.

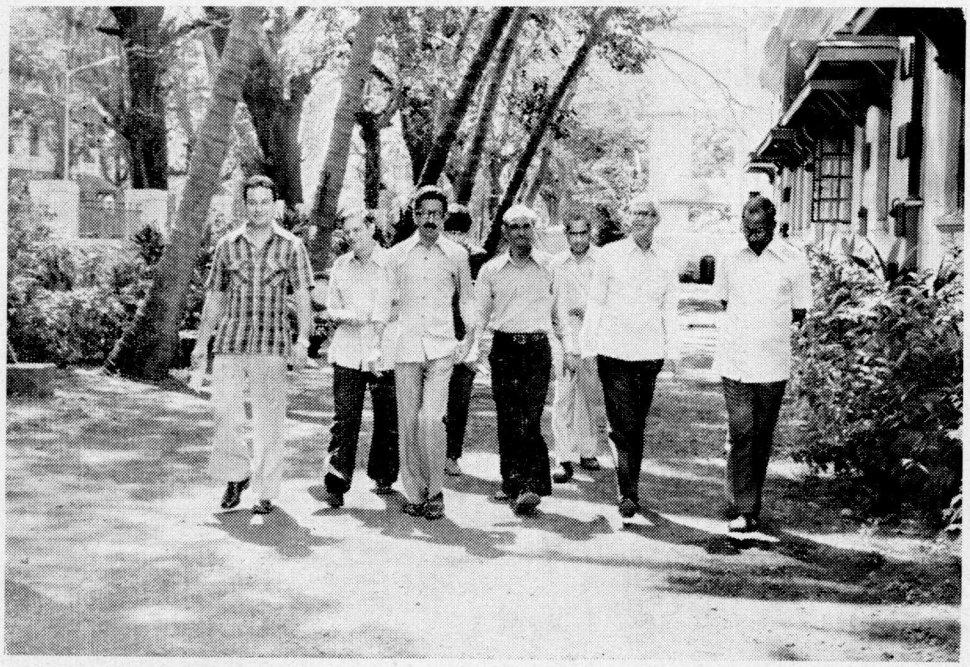
Untreated control and crosslinked fabrics were evaluated for various physico-chemical properties. From the results, it is seen that the samples treated in the presence of mixtures of catalysts (Aluminium Sulphate and Zinc Acetate) showed marked increase in wrinkle recovery angle (WRA) and abrasion resistance values. Durable Press rating (DP) also showed improvement compared to untreated control. Breaking and tearing strengths showed lower values compared to untreated control.

Fabrics, treated in the presence of different concentrations of Aluminium Sulphate and Glycolic Acid showed gradual increase in resin add-on with increase in Glycolic Acid concentration. The treatment also exhibited increase in the degree of crosslinking which was correlated by marked increase in WRA values upto 1.5% conc. of Glycolic Acid. Further, increase in the catalyst, Glycolic Acid, has not improved WRA. The samples treated in the presence of 0.5% Aluminium Sulphate and 1.5% Glycolic Acid showed very high WRA value of 320° and DP rating of 4.5. However, there was considerable loss in strength and abrasion resistance properties. Beyond this, there was no further improvement in WRA with increase in Glycolic Acid concentration. However, it further lowered the strength and abrasion values. All these samples showed very high DP ratings.

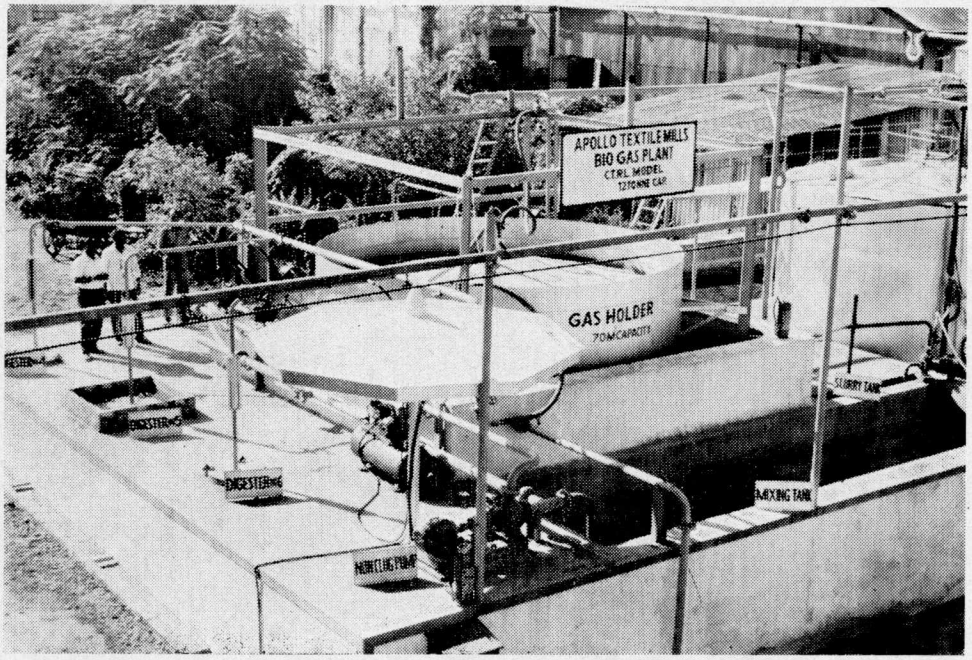
Finishing of Cotton and Blended Fabrics with Resin and Metallic Monomers

Scoured, bleached, mercerised and desized cotton fabrics which were given a simultaneous cross-linking and polymerisation treatment last

PLATE 1

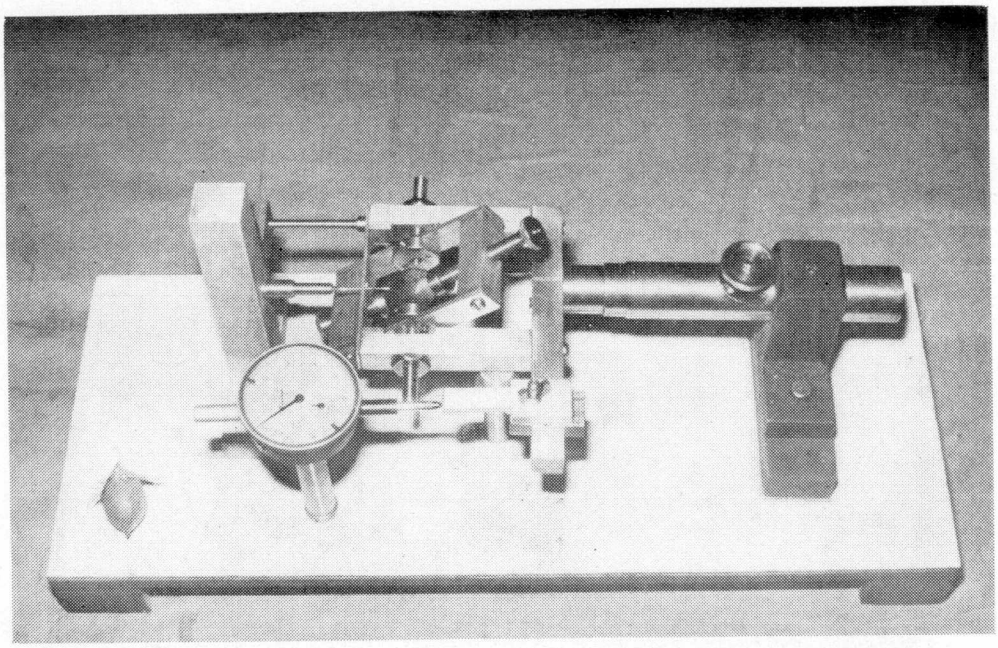


Visit of Press Team to CTRL. (Please refer page 2)

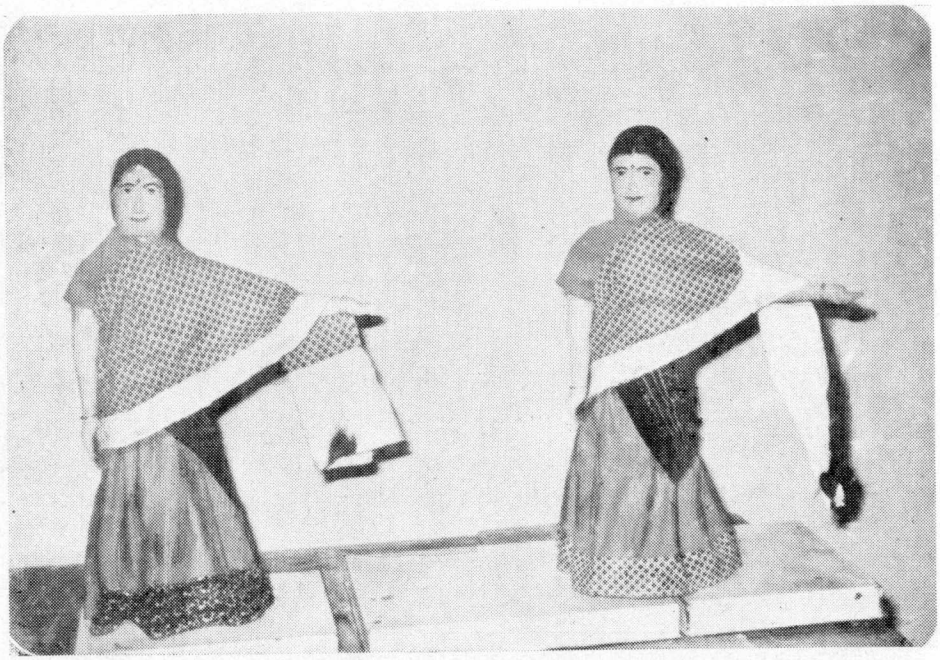


An Overview of the Biogas Plant Commission at Apollo Textile Mills, Bombay. (Please refer page 5)

PLATE 2



Cotton Boll Rind Toughness Tester. *(Please refer page 37)*



Two dolls draped in sarees; one saree treated with Fire Retardant Finish and the other untreated. Note the fire retardancy of the saree of the doll on the left side which has been given FR finishing treatment. *(Please refer page 55)*

year (8% DMDHEU, 1% Softener, 0.1% wetting agent, 0.25% N. N. Methylene bis-acrylamide, 0.5% $K_2S_2O_8$ and Zinc monomers of Acrylic, Methacrylic and Itaconic acids) and the DMDHEU control samples were evaluated for flex abrasion resistance and moisture regain. The retention of abrasion resistance was more for the experimental samples compared to the control samples. The trend of abrasion retention in the experimental samples was Poly Zinc Methacrylate treated > Poly Zinc Acrylate treated > Poly Zinc Itaconate treated. Amongst the controls, 3% DMDHEU + 1.5% $MgCl_2$ $6H_2O$ and 8% DMDHEU + 0.5% $K_2S_2O_8$ treated fabrics showed significantly better abrasion retention than 8% DMDHEU 0.8% Zinc Nitrate and 8% DMDHEU + 4% Glycolic Acid treated fabrics.

Moisture regain percent of the experimentally finished fabrics was on par with the untreated control; but was higher than the 8% DMDHEU + 8% Zinc nitrate treated control.

Drop absorbancy of the experimental samples was much higher than the DMDHEU controls.

The fabrics were also given a simultaneous crosslinking and polymerisation treatment. The finish consisted of 8% DMDHEU, 1% softener, 0.1% wetting agent, 0.25% N. N. methylene bis-acrylamide, 0.5% $K_2S_2O_8$ and Zinc monomers of Acrylic, methacrylic and Itaconic acids. The monomers were prepared by combining 1 eq. of zinc carbonate with 1 mole of the above mentioned acids.

The concentrations of the acids varied from 2% to 6%. The above treated samples were dried at 120°C for 10 minutes and cured at 160°C for 3 minutes.

Studies on Enzymatic and Acid Hydrolysed Cotton

Electron diffraction (ED) patterns recorded on samples continuously treated with cellulase enzyme of **Penicillium funiculosum**, revealed typical cellulose I pattern except for those treated continuously for 18 days. The ED patterns recorded on repeatedly enzyme treated samples revealed spot pattern in which 'd' spacings of the reflections corresponded to those of standard cellulose I pattern. Also the ED pattern on 18 days continuously enzyme treated sample revealed spot pattern similar to that observed in the case of repeatedly enzyme treated samples.

The enzymatic hydrolysis of viscose and polynosic fibres was carried out. The reducing sugar produced as a result of enzymatic hydrolysis at the end of 24 hr was very high in the case of normal viscose fibres compared to those of polynosic fibres.

The mercerised cotton sample was treated continuously with cellulase enzyme of **P. funiculosum** for a period rangnig from 1 day to 3 days. The reducing sugar and percent wt. loss as a result of enzymatic hydrolysis increased progressively with the number of days of hydrolysis upto 3 days. Further, continuous enzyme treatment did not cause marked hydrolysis of the sample because of inhibitory action of glucose and cellobiose produced in the system.

Since prolonged action of cellulase enzyme on mercerised cotton for 4 and 5 days did not cause further hydrolysis, the residual substrate after 3 days enzyme treatment was treated by fresh solution of enzyme. Considering the first enzyme treatment for 3 days as one cycle of treatment, the sample was subjected to 2nd and 3rd cycle of treatment. The reducing sugar on hydrolysis increased from 3500 μg/ml. in the case of 3 days cellulase treatment at a stretch (1st cycle) to 5500 μg/ml and 7500 μg/ml at the end of 2nd and 3rd cycle of treatment, respectively with progressive increase in percent weight loss.

The transmission electron microscopy of residual substrate did not show, in fact, secondary cell wall structure. In the case of samples treated continuously for 1 and 2 days, needle shaped particles were observed while on repeated enzyme treatment, spherical particles of size ranging from 400 A° to 1000 A° were observed.

Studies on Production of Amylase by Bacillus subtilis-159 and Application of the Enzyme

Studies on the effect of oilseed meals, a low cost nitrogen source, on amylase production by **Bacillus subtilis-159** was continued. In earlier experiments it was observed that the oilseed meals of cotton, castor, sesame black and sesame white are suitable for amylase production and can replace peptone from the medium. To ascertain whether the organism utilizes whole oilseed protein or a particular fraction of it for the production of amylase, these four oilseeds meals were fractionated on the basis of their solubility. Four fractions, soluble in water, 0.5 M NaCl, alkali (pH 10) and 80% alcohol, respectively were obtained. The

nitrogen content of each fraction was estimated by the Kjeldahl's nitrogen method. Each fraction was added separately to the medium in such a way that the nitrogen content of the fraction added was equivalent to the amount of the fraction present in the whole meal. **B. subtilis-159** was grown and the amylase produced was estimated. It was observed that the organism grown on alcohol fractions, which had least protein, gave maximum amylase which was well comparable with whole oilseed meal. This indicated that only a small fraction of oilseed meal is responsible for most of the amylase production.

Studies were carried out to prepare thin boiling starches (low viscosity) from native starch using **B. subtilis**-159 amylase. These thin boiling starches are widely used in textile industry as sizing material. Five per cent starch paste, having viscosity of about 900 cps when hydrolysed by **B. subtilis**-159 amylase gave a paste of viscosity of about 65 cps within 15 min which is well comparable with the commercially available thin boiling starch. Further, the **B. subtilis**-159 amylase could be used to prepare starch-based adhesives. The starch paste was hydrolyzed to different degrees by **B. subtilis**-159 amylase and several samples were prepared. These samples have different tack, viscosity and could be used as adhesive for paper to paper, paper to glass, corrugated boards etc. Further, work is in progress.

Studies on the Antibiotic Property of Gossypol

Studies were carried out on the antibiotic property of gossypol on various microorganisms. Deoiled cottonseed meal of Badnawar variety was autoclaved. The treatment gave a meal having no free gossypol, but have had a high percentage of bound gossypol in it. **Bacillus subtilis** AT CC 21223 was grown on a suitable medium and the growth filtrate served as a source of protease. The cottonseed meal prepared as above was treated with the protease (filtrate) and centrifuged. The clear supernatant contained free gossypol.

The effect of free gossypol on some Gram positive organisms, viz. **Bacillus cereus, B. subtilis-159, Saricina leutia Staphylococcus aureus** and a few Gram negative organisms, viz. **Escherichia coli, Salmonella typhosa, Shigella faecalis** and **S. flexenari** was studied for various time intervals by agar cup method as well as tube assay method. It was found that Gram positive organisms were susceptible to the gossypol toxicity as it was evident by the clear zone on the plates and weak growth in tubes. The Gram negative organisms were not affected by the gossypol.

Studies on Biosynthesis of Cellulose by Microorganisms and Higher Plants

Cotton bolls of Suvin variety were collected from 10 days to 55 days post-anthesis and lint weight and length of the fibres were measured. Increase in lint weight and fibre length with the corresponding increase in boll age was taken as measures of cell wall thickening and cell wall elongation, respectively. For the determination of lint weight, fibres of each boll were separated from seeds carefully, washed with 80% alcohol several times and dried at 80°C till constant weight was obtained. Number of seeds in each boll was also noted down and lint weight per seed was calculated. When lint weight per seed was plotted against the boll age, a sigmoidal relationship was observed. At early stages of development, there was not much increase in lint weight but from 25 days post-anthesis onwards there was sharp increase in lint weight which continued upto 35 days post-anthesis, and thereafter a slow increase in lint weight was obseved. The length of fibres from 10 to 55 days post-anthesis was measured and it was observed that at about 28 days post-anthesis maximum fibre length was attained. It may be concluded from the results that before the phase of elongation of cell wall of fibres ceases, the phase of cell wall thickening starts.

Studies were carried out on seeds of developing cotton bolls to confirm the results obtained in previous year. For this, cotton seeds (Suvin variety) were collected at different stages of development from 10 days post-anthesis to maturity. Seed proteins were fractionated on the basis of their solubility in water, salt solution, alkali and alcohol. The fractions obtained were estimated for their nitrogen content by Kjeldahl's method. Changes were observed in nitrogen content of the fractions with respect to the age of the seed. The water soluble proteins (albumins) increased gradually in seeds upto thirty days, decreased in the forty and fifty days seeds and increased again at maturity. The salt-soluble proteins (globulin) increased throughout seed development. The alkali soluable proteins (glutelins) increased initially upto twenty-five days and decreased again in the thirty day seeds. It remained fairly constant in the thirty, forty and fifty day seeds and decreased at maturity. The content of alcohol soluble proteins (prolamin) remained insignificant throughout the development.

In addition to the above work, the total gossypol content of seeds was also studied at different stages of development. It was observed that the gossypol content increased throughout seed development. The accumulation of gossypol was maximum between twenty and fifty days of seed development.

Utilisation of Cellulose Bearing Materials Including Coarse Cottons, and Cotton Plant Stalks for Manufacture of Viscose Pulp and Different Grades of Paper

Cotton plant stalk collected was cut to pieces of about 2 cm. This material was digested with different concentrations of alkali in an autoclave at 20 lb./sq. inch pressure for 2 hr. The digested material was washed thoroughly and then it was mechanically converted into pulp, washed and dried. The above material was weighed and the yield of the pulp was determined.

As necessary equipments are not available to prepare pulp and paper at this Laboratory, further work on this project was carried out in the R & D Laboratory of a paper mill.

Cotton plant stalk was cut to small pieces of about 2 cm. The cotton plant stalk was tested for moisture content and bulk density. The above material was used for preparation of the following two types of pulps :

(1) *Semi-Chemical Pulp*

The semi-chemical pulping was carried out by digesting 300 g oven dry chips of the above material with different concentrations of alkali in a bom digester. The alkali concentrations varied from 5%-15% (as Na_2O) of the oven dry weight of the raw material. The material to liquor ratio was maintained at 1:3 of the oven dry weight of the material. The time of cooking at the maximum temperature 130°C was 2 hr at atmospheric pressure. The cooked chips were passed through the disc refiner. The refining in all cases was done in two passes at 10 and 15 thow. After refining, the cooked material was washed over a flat valley screen. The uncooked chips and bundles were manually picked out, dried and weighed to ascertain the weight of reject. The total yield of the pulp was determined after weighing the screened pulp and the reject.

(2) *Chemical Pulp*

Chemical pulp was prepared by digesting 1.5 kg. of cotton stalk chips in a Research Digester Cook, using 16% of active alkali (Na_2O). The bath ratio was 1:2. The time of cooking at maximum temperature (170°C) was 1.5 hr. The pulp was disintegrated in a disintegrator. It was washed in an IEC centrifuge, to remove the excess chemicals and the black liquor. Then it was subjected to screening through a flat

valley screen to remove the uncooked material. The total yield of the pulp was determined after weighing the screen pulp and the dried rejects.

Bleaching of Pulp

A known quality of semi-chemical and chemical pulp was bleached using hypochlorite in plastic containers in a two step process at a 5% consistency, using 25% (15% + 10%) hypochlorite at 45°C temp. for 2 hr. at 8.2 pH. After bleaching, the pulp was washed till free from hypochlorite and then the yield of the bleached pulp and the brightness were determined.

Sheet Making and Testing

Standard sheets of 60 ± 1 gm were prepared from bleached as well as unbleached pulp of semi-chemical and chemical pulps on a British Standard Sheet Making Apparatus at 38° slowness (SR). The paper sheets were dried in air and then conditioned at 65% RH and 27°C temp. for 2 hr. Conditioned paper sheets were tested for various properties such as breaking length, stress percentage, tear factor, brusting strength, double fold porosity, strength index and brightness using TAPPI standard methods.

Good quality paper sheets were obtained from the above pulp. The data on various properties are being analysed. The chemical analysis of the above pulp is also in progress.

Production of Biogas from Cellulosic Waste from Textile Mills

Laboratory trials indicated that biogas can be effectively produced with a substrate : water ratio of 1:1.5, when sodium hydroxide was used (1% W/W) during aerobic fermentation.

As much as 350 litres to 400 litres of biogas was obtained from 2.5 kg of willow-dust. The same study when extended to pilot plant trials, about 15 m^3 to 17 m^3 of biogas was obtained from 100 kg willow-dust during 30 days of active gas generation phase.

Since the sodium hydroxide added during aerobic fermentation of willow-dust is not desirable from the point of view of obtaining agri-

culturally suitable biomanure, experiments were undertaken to replace sodium hydroxide with lime to the maximum extent possible. It was observed that the yield of biogas remained the same, inspite of reducing the use of NaOH to 0.1%, with the addition of 1.5% lime and 15% inoculum. Further, about 8 m^3 of biogas was obtained in the subsequent 15 days of normal gas generation phase making the entire process viable for a total period of 45 days unlike the earlier process where it was economic only for 30 days.

The dry fermentation of willow-dust consumes less water, accommodates more fermentable material in the unit space, produces more gas and leaves behind good quality of readily usable biomanure.

Studies on the Utilisation of Cellulosic Wastes for the Production of Mushrooms

Attempts were made to grow **Pleurotus sajor-caju** on willow-dust compost in galvanized trays presuming that it can grow better than on willow-dust. Though the nutrients were readily available, the mushroom did not grow, perhaps due to the competition of other microbes, since the compost was not pasteurised before spawning.

Since facilities to grow **Agaricus bispores** on willow-dust compost is not available at CTRL presently, Dr. H. S. Garcha, Senior Mycologist (mushrooms), Department of Microniology, Punjab Agricultural University, Ludhiana was requested to explore the possibilities of raising the same mushroom on the compost prepared from willow-dust. As he readily agreed to extend help in this direction, about 100 kg of compost prepared at CTRL alongwith one gunny bag of willow-dust as such (to prepare compost at PAU Campus by following CTRL technology) and about 10 kg. of anaerobically digested willow-dust to try as casing material were despatched during the last week of November, 1983. The experiments are already under way and the results are awaited.

Fatty Acid Composition of Cottonseed Oil of Different Varieties

During the period under report, seed samples of Hybrid 4 grown at six different places were collected to study the effect of place on oil content and fatty acid composition of cotton-seed oil. Oil content estimation was carried out as per standard methods and fatty acid composition was determined by Gas-liquid Chromatograph. The results are shown in Table 17.

TABLE 17 : FATTY ACID COMPOSITION OF HYBRID 4 SEEDS FROM DIFFERENT PLACES

Place	Oil Content	Fatty Acid (%)					
		Myristic	Palmitic	Palmitoleic	Stearic	Oleic	Linoleic
1. Ahmednagar	19.63	0.91	26.57	0.69	2.79	18.24	50.80
2. Majalgaon	19.83	1.00	24.95	0.73	2.74	18.45	52.14
3. Nanded	21.13	1.04	25.86	0.76	2.80	18.55	51.00
4. Khargaon	21.56	0.97	27.93	0.94	2.46	18.48	49.21
5. Pachora	19.17	1.12	28.15	0.89	2.51	18.68	48.65
6. Nagpur	20.47	1.06	29.01	0.86	2.82	19.49	46.75

It can be seen from the Table that there is marked variation in oil content, palmitic, palmitoleic and linoleic acids in the same variety grown at six different places.

Further, study was also carried out on seeds of Laxmi cotton from different stages of growth to examine the biosynthesis of fats and component fatty acids in cottonseeds. Seed samples were collected from bolls during 20 days to 70 days period after flowering at weekly intervals.

From the analysis of data, it was seen that the oil content in seed samples from different stages of growth showed marked increase after 30 days. The oil content in seeds of 20 days old boll was 2.10% and it was 20.15% in seeds of 40 days old boll. Thereafter, the fat content showed slight increase with advancement in age. Fatty acid composition showed gradual decrease in percentage myristic acid with increase in the age of the boll. Palmitic acid content showed marked change from 59.15% in 20 days old samples to 23.05% in 40 days old samples. A similar trend was noted in the case of palmitoleic and stearic fatty acids, although these were present in smaller quantity. Linoleic acid, one of the most important fatty acids, increased from 7.65% in 20 days old seed samples to 51.88% in 40 days old seeds. However, the percentage of oleic acid remained unchanged throughout the growth process.

Esterification and Isolation of Fatty Acids Especially, Palmitic, Oleic and Linoleic Acids from Cottonseed Oil

During the period under report, the saturated and unsaturated fatty acid constituents were separated by lead salt formation and exploiting the solubility property of the two types of salts in water, diethylether

and petroleum naphtha. Stearic Acid and Palmitic acid got separated from the mixtures of saturated fatty acids when saturated fatty acid mixture was allowed to crystallise in acetone at —15°C by fractional crystallisation.

Analysis and Grading of Cotton Linters

Experiments were conducted to determine the contribution of different kinds of trash, viz. leaf-bits, hulls, bolls, burrs, bracts, etc. towards ash and iron contents.

Cleaned cotton was mixed with 10% each of the trash mentioned above and then digested with different concentrations of sodium-hydroxide at 170°C in an autoclave. The raw (undigested) and the digested samples were analysed for ash and iron contents.

The ash and iron content of the trash mixed sample decreased on digestion. However, the extent of decrease was not the same with different trash materials as leaf-bits, hulls, bolls, etc.

The results of the reduction in ash and iron contents of trash mixed samples indicated that it was difficult to completely disintegrate and remove the trash existing in different forms by digestion (Kierboiling) and that the presence of leaf-bits may increase ash content, whereas bolls may increase iron content.

Utilisation of Cotton Plant and Cottonseed By-products with Special Reference to Cottonseed Hull

During the period under report, further work was carried out on the preparation of particle boards from powdered cotton seed hull. Some of the work on preparation of particle boards from cottonseed hull, reported last year was repeated for confirmation of results. Hull powder was mixed with resin binder and catalyst by varying the concentrations of resin binder from 0-18% and keeping the moisture level at 15% at the time of pressing. The pressure applied was 150 kg/cm^2. These sample boards thus prepared were evaluated for moisture content, density, water absorption, tensile strength and bending strength. From the results, it is observed that the tensile strength, modulus of rupture and density showed gradual increase while moisture content and water absorption showed gradual decrease with increase in resin concentrations.

Further work on preparation of particle boards from powdered cottonseed hull was carried out. Two sets of boards were prepared

keeping the concentration of resin binder constant for each set, viz. 15% and 18% respectively, and varying the moisture content from 8% to 15% in the material before pressing it on heated platens of hydraulic press. The pressure applied was 150 kg/cm^2 and the size of board made were 15 cm x 15 cm, keeping the temperature of platens at 160°C in all the cases.

The boards thus prepared were evaluated for tensile strength, bending strength and modulus of rupture. From the results, it was observed that with increase in moisture content, tensile strength and modulus of rupture showed increase in both the sets of boards prepared.

Further work on this project is in progress.

RESEARCH WORK CARRIED OUT AT REGIONAL QUALITY EVALUATION UNITS

1. COIMBATORE

30 samples each of medium (30s-40s), fine (50s-60s) and superfine (80s) counts were spun on the SMSP installed at this unit, and tested for lea CSP. Twist Multiplier 4.2 was common for all counts. The same samples were also spun to the respective counts by the microspinning procedure adopted at the CTRL. It was observed that corrected CSP of SMSP was lower by 15% for 30s and 40s counts. The differences were 25% for 50s and 60s counts and 35% for 80s count. Accordingly, it was decided as an interim measure to correct the CSP values determined by SMSP by adding 15% to the CSP values of 30s and 40s counts, and 25% to 50s and 60s count and 35% to 80s and above. However, further work is being taken up to identify the causes for this large difference in CSP values.

2. GUNTUR

Evaluation of synthetic pyrethroids for the control of boll worms

In this experiment MCU. 5 grown under rainfed conditions was studied. The treatment consisted of 11 pyrethroid treatments (including control) with three replications. The variations in fibre properties between the three treatments and between the three replications among the different treatment, were studied. The best result was obtained with cypermethrin treatment.

Boll-shedding in Cotton and Influence of mechanical pruning on growth and development of cotton

The trial was conducted on MCU. 5 and Varalaxmi under rainfed conditions during 1982-83 season. Two experiments were involved in this trial, viz. 'Boll Shedding' and 'Influence of mechanical and chemical pruning'. In boll shedding experiment best results were obtained with NAA @ 10 ppm and 30 ppm at 60 days after sowing for MCU. 5 and NAA @ 30 ppm at 60 days after sowing and NAA @ 10 ppm at 60 and 90 days after sowing for Varalaxmi. In the second experiment, the best results were obtained with treatments of Lihocin at 75 ppm and with combined treatment of removal of monopodials at 45-75 days after sowing + Lihocin at 75 ppm at 75 days after sowing for MCU. 5 cotton. In the case of treatments given to Varalaxmi cotton, Lihocin at 100 ppm at 75 days after sowing and combined treatment consisting of removal of monopodials at 45-75 days after sowing + Lihocin at 100 ppm at 75 days after sowing were found to be advantageous, in respect of fibre quality.

3. LUDHIANA

Effect of insecticide treatments on fibre quality

An experiment was laid out at PAU, Ludhiana to study the effect of different insecticides on fibre quality of LD. 230. The crop was sprayed five times with different insecticides starting from the first week of August. While monocrotophos treatment improved fibre length, Decamethrin and carbaryl treatments improved bundle tenacity.

Effect of pink bollworm infestation on fibre quality

The study was conducted at PAU, Ludhiana on LD. 133, G. 27, LD. 230 and LD. 251 varieties. The bolls with all healthy loculi and damaged loculi were tested for fibre quality. The bollworm damage had slightly decreased mean length and Micronaire value. It had not shown any effect on bundle tenacity. Similar results were obtained in another experiment, effect of pink bollworms on four varieties of **G. hirsutum** and four varieties of **G. arboreum.**

4. SURAT

Effect of spacing, plants per boll and nitrogen levels on economic and fibre characteristics of Hybrid 6 variety

This study has been done in collaboration with the GAU, Surat. Hybrid 6 is a prominent variety released recently in Gujarat. This

study has been taken up during 1980-83 season to standardise the agronomic practices for obtaining optimum yield and quality. The treatments consisted of three levels of spacing, two levels of plant/hill and four levels of nitrogen. The different spacings and plant populations were not found to affect the yield, which was increased progressively for additional dose of nitrogen. The maximum yield was obtained at 240 kg/ha. The effect of spacing, plant population and nitrogen was not significant on fibre quality.

Quality of cotton lint developed at different positions of boll in relation to time of picking

It is not apparent whether the position of boll formation has any effect on the quality. Therefore, this study was undertaken on G. Cot. 10 and G. Cot. 11, varieties of 1981-82 season. The treatments were three pickings and three positions of bolls. Later pickings were found to produce immature fibres. In the case of G. Cot. 10 different positions of the boll did not exhibit any affect on the fibre properties. For G. Cot. 11, fibres from top bolls were significantly shorter than fibres from bottom bolls.

Study of green fuzz in ginned lint

This study was continued on the same lines as last year. There were four parents (two with green fuzz seed and two with white fuzz seed). Their daillelle crosses in F2 were sown in randomized blocks. Texas green, a parent with 100% green fuzz gave maximum green fuzz in F2 generation. Other green fuzz parent 6268 produced equal amounts of both seeds. G. Cot. 100 and G. Cot. 10 gave only white fuzz seeds. The lint obtained from green fuzz seed had been mostly immature.

3. PUBLICATIONS

During the year 1983 two Technological Reports, 27 Research Publications and 41 Technological Circulars were issued in addition to 11 papers presented at various Conferences.

A. Technological Reports

No. 31 : Technological Report on Trade Varieties of Indian Cottons, 1981-82 season.

No. 32 Technological Report on Standard Indian Cottons, 1981-82 season.

B. Research Publications (CTRL Publication New Series)

No. 214 Some SEM Observations on OE Spun Yarns — by S. M. Betrabet, N. Balasubramanyan, K. M. Paralikar and M. S. Parthasarathy (Reprinted from BTRA Scan, Vol. XIII, No. 1, March, 1982).

No. 215 Enzymatic Saccharification of Cellulosic Materials — by A. S. Dighe, V. G. Khandeparkar and S. M. Betrabet (Reprinted from Indian Journal of Microbiology Vol. 21, No. 2 April-June 126-130, 1981).

No. 216 A Study of the Lea Strength of Cotton Yarn Conditioned at 65% rh and Tested at Different Ambient Humidity Levels — by L. R. Jambunathan, P. V. Varadarajan, K. Janaki Iyer and K. R. Krishna Iyer (Reprinted from Journal of Textile Association, May, 1983).

No. 217 Inter-relationship Between Tensile, Tearing and Bursting Strength — by S. R. Ganatra and V. G. Munshi (Reprinted from Journal of Textile Association, May, 1983).

No. 218 Effect of Testing Speed of Instron on Fibre Bundle Tenacity — by J. K. S. Warrier and V. G. Munshi (Reprinted from Journal of Textile Association, May, 1983).

No. 219 Study of the Effects of Nitrogenous and Phosphatic Fertilisers on the Yield and Quality of the Cotton, Hybrid-4 — by L. R. Jambunathan, N. P. Mehta, C. J. Sanadia and P. M. Patil (Reprinted from Journal of Indian Society for Cotton Improvement, Vol. VI, No. 2, September, 1981).

No. 220 Comparative Efficacy of Insecticides against Pink Bollworms as also on the Yield and Quality of Cotton (**G. Hirsutum** Variety, H. 14) — by S. N. Nagwekar, A. P. Jayaswal and R. K. Saini (Reprinted from Cotton Development Journal, Vol. 12, Nos. 1 and 2, 63-65).

No. 221 Studies on Optimum Conditions of Enzymatic Desizing of LTKP Sized Fabric by Cellulase Steeping and Cellulase Padding Methods — by S. P. Bhatawdekar (Reprinted from Journal of the Textile Association May, 1983).

No. 222 Studies on Blends of Indian Cottons with Polyester Fibres — by M. S. Parthasarathy, B. Srinathan and V. Sundaram (Reprinted from "Blended Textiles" — Proceedings of the 38th All India Textile Conference and International Textile Conference held at Bombay, November 18-20, 1981).

No. 223 An Insight into the Overshoot Phenomenon in Pressley Tester — by J. K. S. Warrier, K. R. Krishna Iyer and V. G. Munshi (Reprinted from Textile Trends, June 1982).

No. 224 A Quick Evaluation of Linear Density of Man-made Fibres from Micronaire Values — by D. N. Makwana and V. G. Munshi (Reprinted from Journal of Textile Association, September, 1983).

No. 225 Influence of Weaker Strands on the Strength of a Skein — by A. V. Ukidve, K. R. Krishna Iyer and G. Viswanathan (Reprinted from Journal of Textile Association, September, 1983).

No. 226 Relationship between Stelometer Breaking Elongation and Fineness and Maturity — by D. N. Makwana and V. G. Munshi (Reprinted from Indian Journal of Textile Research, Vol. 8, 52-54, June, 1983).

No. 227 : SEM Observations on Rotor Spun Polyester Yarns — by K. M. Paralikar, B. Srinathan, M. S. Parthasarathy and N. B. Patil (Reprinted from Indian Textile Journal, May, 1983).

No. 228 : Effect of Picking Time and Interval on the Quality of Cotton — by S. N. Nagwekar, M. S. Kairon and Vijeshwar Singh (Reprinted from Cotton Development Journal, 2-138-DCD/Bom. 83, page 5-8).

No. 229 : Some Practical Hints for Better Spinning of Cotton with Roller Gins — by D. G. Shete and V. Sundaram (Reprinted from Journal of Indian Cotton Mills' Federation, October, 1983).

No. 230 : Evaluation of Micronaire Value by Digital Fibrograph — by D. N. Makwana and V. G. Munshi (Reprinted from Textile Research Journal, Vol. 53, No. 8, August, 1983).

No. 231 : Assessment of Crease Recovery Values of Textile Fabrics by Different Instruments — by S. Subramaniam, G. R. Phalgumani and B. R. Manjunatha (Textiles Committee) and M. S. Sitaram, A. W. Shringarpure and I. G. Bhatt (Reprinted from Indian Journal of Textile Research, Vol. 8, 16-22 March, 1983).

No. 232 : Birefringence of Stretched Cellulose Films — by K. R. Krishna Iyer, S. Sreenivasan and N. B. Patil (Reprinted from Textile Research Journal Vol. 53, No. 7, July, 1983).

No. 233 : On the Frequency Shift of the C = O Band in the Infrared Spectrum of Gamma Irradiated Cellulose I and Cellulose II — by P. Bhama Iyer, K. R. Krishna Iyer and N. B. Patil (Reprinted from Journal of Applied Polymer Science, Vol. 28, 879-881, 1983).

C. Other Publications

1. Structural Study of Cellophane — by S. Aravindanath, K. M. Paralikar, S. M. Betrabet and N. K. Chaudhuri (Polymer, Vol. 23, 823-828, June 1982).
2. Scanning Electron Microscopy of Some Textile Materials — by K. M. Paralikar (Journal of the Indian Society for Cotton Improvement, Vol. VII, 47-52, September, 1982).

3. Optical Anisotropy as an Analytical Tool for the Study of Chemically Modified Cotton — by S. Aravindanath (Colourage Vol. XXIX, No. 23, 3-5 November, 1982).

4. Some Practical Hints for Better Ginning of Cotton with Roller Gins — by D. G. Shete and V. Sundaram (Journal of the Indian Society for Cotton Improvement, Vol. VIII, 45-53, September, 1983).

5. Influence of Insecticide Treatments on Physical and Chemical Properties of G. Cot. 100 Variety — by R. M. Gurjar, P. A. Dabholkar, V. G. Munshi and N. P. Mehta (Journal of the Indian Society for Cotton Improvement, Vol. VIII, 74-81, September, 1983).

6. Effect of Insecticides, Fungicides and their Combinations on the Fibre Properties of Laxmi Cotton — by G. M. Padaganur, M. K. Basavaraj and E. S. Abraham (Journal of the Indian Society for Cotton Improvement, Vol. VIII, 90-92, September, 1983).

7. Biogas from Willow-Dust by Dry Fermentation — by R. H. Balasubramanya, V. G. Khandeparkar, and V. Sundaram, (Journal of the Indian Society for Cotton Improvement, Vol. VIII, 93-94, September, 1983).

8. Electron Diffraction Study of Regenerated Cellulose Fibres — by N. K. Chaudhuri, S. Aravindanath, S. M. Betrabet (Textile Research Journal, Vol. 53, November, 1983).

9. Quality of Cotton Seed used for Planting — by S. B. P. Rao and V. Sundaram (Journal of Indian Cotton Mills Federation, November-December, 1983).

10. Relevant Post-Harvest Practices for Maintaining Fibre and Seed Quality in Cotton — by V. Sundaram (Journal of Indian Cotton Mills Federation, November-December, 1983).

11. Nep Counting at the Card by Templates — by G. S. Rajaraman (Textile Research Journal, Vol. 53, December, 1983).

12. Technological Performance of Various Hybrid Cottons — by P. G. Oka and V. Sundaram (Indian Farming, XXXIII, December, 1983).

D. Papers Presented at Conferences/Seminars

1. Influence of Spinning and Carding Conditions on Open-end Spinning Performance — by B. Srinathan and M. S. Parthasarathy (Presented at the Twenty-fourth Joint Technological Conference of BTRA, ATIRA and SITRA held at SITRA, Coimbatore on February 24 and 25,1983).

2. Seed Analysis and Fatty Acid Composition of Kapok Seeds — by S. N. Pandey and N. Thejappa (Presented at the Thirty-eighth Annual Conference of Oil Technologists Association of India held at Calcutta on February 19 and 20, 1983).

3. Recent Developments in the Determination of Cyclopropenoid Fatty Acid — by S. N. Pandey (Presented at the Thirty-eighth Annual Convention of Oil Technologists Association of India held at Calcutta on February 19 and 20, 1983).

4. Some Studies on the Digital Fibrograph Clamp Technique for Assessment of Fibre Configuration — by T. N. Ramamurthy Rao, Muntazir Ahmed and M. S. Parthasarathy (Presented at the Twenty-fourth Joint Technological Conference of BTRA, ATIRA and SITRA held at SITRA, Coimbatore on February, 24 and 25, 1983).

5. Effect of Swelling and Stretching of Normal Viscose Rayon Filaments in Sodium Hydroxide — by K. R. Krishna Iyer, N. B. Patil and V. Sundaram (Presented at the Twelfth Technological Conference of SASMIRA held at Bombay on April 30 and May 1, 1983).

6. Quality of Cotton Seed used for Planting — by S. B. P. Rao and V. Sundaram (Presented at the Seminar on Cotton Productivity Challenges in the Eighties held at Hubli on October 29 to 31, 1983.

7. Better Utilisation of Cotton Seed — by M. S. Sitaram, I. G. Bhatt, P. V. Varadarajan and V. Sundaram (Presented at the Seminar on Cotton Productivity Challenges in the Eighties held at Hubli on October 29 to 31, 1983).

8. Relevant Post-Harvest Practices for Maintaining Fibre and Seed Quality of Cotton — by V. Sundaram (Presented at the Seminar on Cotton Productivity Challenges in the Eighties held at Hubli on October 29 to 31, 1983).

9. Low-cost Carbon and Nitrogen Source for the Production of Amylase by Bacillus-subtilis — 159 — by S. G. Gayal and V. G. Khandeparkar (Presented at the Twenty-fourth Annual Conference of Association of Microbiologists of India held at Hyderabad on November 12 to 14, 1983).

10. Bioenrichment of Agricultural Wastes with a Free-living Nitrogen Fixing Bactirium and Mushroom Fungus — by R. H. Balasubramanya and S. P. Bhatawdekar (Presented at the Twentyforth Conference of Association of Microbiologists of India held at Hyderabad during November, 12 to 14, 1983).

11. Recent Development in Energy Preservation Techniques in Resin Finishing — by S. N. Pandey and A. J. Shaikh (Presented at Fortieth All India Textile Conference organised by the Journal of the Textile Association, Ahmedabad held at Ahmedabad during December 4 to 6, 1983).

E. Technological Circulars on Trade Varieties of Indian Cottons

T. C. No.	Variety	Place	T. C. No.	Variety	Place
		1981-82 Season			
2213	Western-1	Bellary	2226	J. 34 S/G	Raisinghanagar
2214	Deshi	Bilwara	2227	Gaorani 6	Bhaisa
2215	Varalaxmi	Idar	2228	Hybrid 6	Vadalai
2216	Virnar	Chaumilla	2229	Jyoti	Sendhwa
2217	Hybrid 6	Modasa	2230	Sankar 4	Mandela
2218	Bengal Deshi	Sriganganagar	2231	Varalaxmi	Khach Rod
2219	J. 34 S/G	Hissar	2232	Bikaneri Narma	Sriganganagar
2220	J. 34 R/G	Gajsingpur	2233	V. 797	Dholka
2221	Virnar	Bijapur	2234	Jayadhar	Gada
2222	H. 777	Alisdar	2235	G. Cot. 12	Limobodi
2223	Narmada (A. 51-9)	Barwaha	2236	Hybrid 4	Jalna
2224	J. 34 R/G	Hissar			
2225	F. 414	Muktasar			

F. Technological Circulars on Standard Indian Cottons

S.C. No.	Variety	Place	S.C. No.	Variety	Place
		1982-83 Season			
234	Hybrid 4	Surat	243	Maljari	Khargone
235	Hybrid 6	Surat	244	Badnawar 1	Badnawar
236	G. Cot. 10	Surat	245	Gaorani 46	Parabani
237	Buri 1007	Achalpur	246	Sanjay	Parabani
238	Sanjay	Amreli	247	Sanjay	Amreli
239	Suyodhar	Bagalkot	248	G. Cot. 10	Parabani
240	Maljari	East Nimad	249	Gaorani 22	Raichur
241	Khandwa 2	East Nimad	250	Raichur 51	Raichur
242	Deviraj	Junagadh			

4. EXTENSION

CTRL does not have the facility of a farm attached to it to undertake field trials in connection with the cotton growing research and hence most of this field work is done at the Central Institutes and Agricutural Universities in various parts of the country. However, CTRL and its twelve Regional Units actively participate in their endeavours to evolve new and improved varieties from time to time under AICCIP and different State schemes. Even though the Laboratory is not directly dealing with the farming community, extension services are indirectly rendered to cotton growers by testing and supplying reliable and accurate data on various desired quality parameters of samples sent by them/trade/industry/Government/civil organisations, etc., by conducting training courses in cotton technology including ginning and by publishing continuously papers on the various findings of research. Due importance also is regularly being given in developmental activities of new equipments useful for tests in the fields, apart from their fabrication and supply.

Testing Work

Apart from the research samples received from various agricultural stations, CTRL continued to receive a number of samples of fibre, yarn and cloth for special tests from Government and Semi-Government organisations as well as from Trade and Textile Industry, on payment of the prescribed test fees. There was considerable increase in the activities of the Testing House during the year under report, as the number of samples received for tests was comparatively large. Information on the number of samples received and tested during the year 1983 together with the corresponding figures for 1981 and 1982 and average for the quinquennium 1976-80 are given in Table 18.

The total amount of fees realised during the calendar year 1983 through paid tests was Rs. 35,965.00 as against Rs. 23,582.00 during 1982.

Besides the usual tests of routine nature, the following special tests were also carried out on some of the samples received for paid tests.

1. One polynosic fibre sample received from a mill from South India was subjected to tests for denier by cutting method and mean length by oil plate method.

2. Trash content was determined by Esstiel Sliver Trash Analyser (U.K.) on six samples of card slivers received from a mill, and the results were communicated to the party.

TABLE 18 : NUMBER OF SAMPLES RECEIVED FOR PAID TESTS

Type of Test	Average for the quinquennium 1976-80	1981	1982	1983
Spinning	51	34	53	20
Fibre (EICA)*	158	130	97	78
Fibre (Others)	121	48	79	159
Yarn	48	69	44	227
Cloth	76	47	54	61
Moisture	—	40	38	48
Miscellaneous	17	14	29	55
Total	471	382	394	648

* These samples from East India Cotton Association (EICA) Ltd., Bombay are tested free of charge as EICA reciprocates by supplying, free of charge, a number of samples (6 kg each) of the Trade Varities and also the Grader's Valuation reports on samples of improved cotton strains sent to them by this Laboratory.

3. Two samples weighing 6 kg. each of drawing sliver (after combing and one post combing passage through conventional drawing) were received from a Bombay based spinning and manufacturing company for open end spinning trials. Open-end spinning for 20s count was carried out on these samples by running the same through one more passage of drawing. The results were despatched to the party with comments.

4. Nine samples of second-cut cotton linters were received from a synthetic fibres and chemicals manufacturing firm, for carrying out tests for cellulose content, iron content, ash content and H_2SO_4 insoluble matter content (before and after purification). The test procedures were standardised and the results communicated to the party.

5. Isomed Division of BARC sent two samples of surgical linen suture thread for carrying out strength tests and yarn diameter (by optical method). The tests were carried out and the results reported.

6. Photomicrographs were taken on the cross-sections of the seven yarn samples received from a reputed firm in Baroda. The micrographs at various magnification levels along with comments were sent to the party.

7. Twelve Cashmilon fibre samples were received from a petrochemical organisation for cross-sectional details and SEM photographs. The work was carried out and the micrographs were supplied to the party.

8. Various tests as per ISI specifications were carried out on three samples of cotton crepe bandage used for medical purposes received from a Pune firm. The results incorporating comments were communicated.

9. X-ray diffraction analysis was done on two samples (USP reference and Magaldrate samples) sent by a pharmaceutical firm in Bombay. The results of the analysis with comments were reported.

Training

CTRL conducts two full time training courses lasting seven to eight weeks, one from July to September and the other from September to November, for personnel deputed by cotton trading and textile manufacturing organisations in Bombay and Moffusil centres. The course includes lectures and practical work on methods of evaluation of cotton fibre quality and interpretation of test results based on statistics. During the period 1983, the following seven nominees attended the training course held from September 5 to November 2, 1983 :

1. Shri Navin R. Shroff,
C/o. East India Cotton Association Ltd.,
Cotton Exchange, Marwari Bazar, Bombay-400 002.

2. Shri Sunil Hansraj Merchant,
Shanti Niketan, 95-A Marine Drive,
6th floor, Block No. 37, Bombay-400 002.

3. Shri Vasant P. Wakchaure,
C/o. Forensic Science Laboratory of Maharashtra State,
Byculla, Bombay-400 008.

4. Shri Manish Chandrakant Shah,
C/o. M/s. Anil Cotton Co.,
2238/Mahurat Pole, Manek Chowk, Ahmedabad.

5. Shri N. Narasimhalu,
C/o. The South India Cotton Association,
14C/14D, T. B. Road, Coimbatore.

6. Shri T. Anbazhakan
Sri Sarada Mills (a unit of NTC),
Sundarapuram, Coimbatore.

7. Shri C. Loganathan,
C/o. Kaleeswara Mills (a unit of NTC)
P. B. No. 2427, Coimbatore.

In addition, Technician's training was imparted to the following person from Gokak Mills, for a period of one month from January 18 to February 19, 1983.

Shri V. P. Paranjpe,
C/o. Gokak Mills,
Division of Gokak-Patel Volkart Ltd.,
Forbes Bldg., M. Charanjit Rai Marg,
P. B. No. 79, Bombay-400 001.

Special training was imparted to the following ten officers from Cotton Corporation of India during the period July 18 to August 6, 1983.

1. Mrs. M. R. Rao
2. Shri M. J. Makhecha
3. Shri P. T. Pillewar
4. Shri R. P. Singh
5. Shri H. S. Lodhaya
6. Shri J. I. Patel
7. Shri S. M. Shah
8. Shri M. M. Suthar
9. Shri G. C. Mishra
10. Shri P. T. Langare

Further, Dr. B. B. Bargale of Textile Institute, Ichalkaranji, Distt. Kolhapur, has been given special training in Textile Physics, Textile Testing and Statistics, for a period of three and half months from July 18 to November 1, 1983.

5. CONFERENCES AND SYMPOSIA

Director and Scientists of the Laboratory participated in the following scientific and technological conferences and meetings connected with the work of this Laboratory.

S. No.	Meeting/Conference	Place	Date	Name of Officers who attended the Meeting/Conference
1	2	3	4	5
1.	Meeting of the Management Committee of CICR, Nagpur	Coimbatore	5-1-1983	Dr. V. Sundaram
2.	Eighth Meeting of Standing Committee on Cotton of ICMF.	Bombay	17-2-1983	Dr. V. Sundaram
3.	Thirty-eighth Annual Convention of Oil Technologists Association of India	Calcutta	19-2-1983 and 20-2-1983	Dr. S. N. Pandey and Shri L. K. Suri
4.	Twenty-fourth Joint Technological Conference of ATIRA, BTRA and SITRA held at SITRA	Coimbatore	24-2-1983 to 26-2-1983	Dr. V. Sundaram Shri M. S. Parthasarathy, Dr. V. G. Munshi Shri T. N. Ramamurthy and Shri B. Srinathan
5.	Joint Review Meeting of ICDP	Rahuri	10-3-1983 and 11-3-1983	Dr. V. Sundaram
6.	Seminar on Raman Spectroscopy Organised by Blue-Star, Bombay	Bombay	23-3-1983	Dr. S. Sreenivasan and Dr. P. Bhama Iyer
7.	North Zone Panel Meeting of AICCIP held at IARI	New Delhi	7-4-1983 and 8-4-1983	Dr. V. Sundaram and Shri P. G. Oka
8.	Meeting of the ICDP (World Bank) held at ICAR	New Delhi	9-4-1983	Dr. V. Sundaram
9.	Twelfth Technological Conference of SASMIRA	Bombay	30-4-1983 and 1-5-1983	Dr. N. B. Patil and Dr. K. R. Krishna Iyer

1	2	3	4	5
10.	Central Zone Panel Meeting of AICCIP held at CICR	Nagpur	17-5-1983 and 18-5-1983	Shri P. G. Oka and Shri M. S. Sitaram
11.	South Zone Panel Meeting of AICCIP held at Tamil Nadu Agricultural University	Madurai	16-6-1983 and 17-6-1983	Shri P. G. Oka
12.	Seventh Conference of Agricultural Research Statisticians of the ICAR Institutes organised by Indian Agricultural Statistics Research Institute	Bangalore	28-7-1983 to 30-7-1983	Shri G. S. Rajaraman
13.	Fourth Meeting of the Cotton Research Advisory Committee of ICMF and Ninth Meeting of the Standing Committee on Cotton of ICMF	Bombay	1-9-1983	Dr. V. Sundaram
14.	Meeting of the ICAR Regional Committee No. 7.	Nagpur	5-9-1983 and 6-9-1983	Dr. V. Sundaram
15.	Symposium on Man-made Fibres organised by IIT, New Delhi	New Delhi	7-10-1983 and 8-10-1983	Dr. K. R. Krishna Iyer and Dr. P. K. Chidambareswaran
16.	Conference of the Directors of ICAR Institutes	New Delhi	21-10-1983 and 22-10-1983	Dr. V. Sundaram
17.	Seminar on Cotton Productivity Challenges-80's	Hubli	29-10-1983 to 31-10-1983	Dr. V. Sundaram, Dr. V. G. Munshi and Shri M. S. Sitaram
18.	Twenty-fourth Annual Conference of Association of Microbiologists of India	Hyderabad	12-11-1983 to 14-11-1983	Dr. V. G. Khandeparkar, Dr. R. H. Balasubramanya and Shri S. G. Gayal
19.	Fortieth All India Textile Conference organised by Textile Association, Ahmedabad	Ahmedabad	4-12-1983 to 6-12-1983	Dr. S. N. Pandey and Shri A. J. Shaikh

1	2	3	4	5
20.	Thirty-ninth Annual Convention of Oil Technologists Association of India and Seminar on Technology and Product Mix Forecast of Oils and Fats in 2000 A.D.	Bombay	11-12-1983 and 12-12-1983	Dr. S. N. Pandey and Shri N. Thejappa
21.	Eleventh All India Federation of Indian Photography Convention	Bikaner	17-12-1983 to 19-12-1983	Shri R. M. Modi

In addition to the above, Director and other scientists of the Laboratory attended meetings of some Sub-Committees of the Indian Standards Institution, pertaining to the standardisation of textile materials and test methods.

The Director also attended various meetings of the Board of Directors of the Cotton Corporation of India, Governing Council of BTRA, the Board of Management of VJTI and the Cotton Advisory Board of Textile Commissioner.

6. SUMMARY OF THE REPORT

This is the Sixtieth Annual Report of CTRL covering the calendar year 1983.

As usual, CTRL was functioning in close collaboration with the Agricultural Scientists and Cotton Breeders in various parts of the country to produce more and better quality cottons and to increase better utilisation of cotton lint and cotton plant by-products and thereby improve the economy of the country. The total number of books in the Library by the end of 1983 was 3501 while the number of journals received was around 198. Director and other scientists continued to represent CTRL and ICAR in various committees/bodies, etc. The total number of samples received for tests from various agricultural trials was 2472 and those received for paid tests were 648. A total amount of Rs. 35,965/- was received by way of test fees during 1983.

Research Activities

The laboratory continued to function as the coordinating centre for technology under the AICCIP and as a result of concerted efforts of all the scientists in various disciplines including technologists, the following new varieties of cotton were recommended for release :

S. No.	*Variety*	*Salient Features*
1.	DS. 1	An early maturing **arboreum** strain evolved by gamma-radiation of the seed of the existing strain G. 27; staple around 17.8 mm and Micronaire value around 7.7.
2.	TNB. 1	A **barbadense** Egyptian type variety released by the Govt. of Tamil Nadu for the irrigated tracts of the state; it has long, fine and strong fibres and can be spun to 100s count.

The study on the quality of cotton lint from bolls at different positions on the plant in its relation to the time of picking indicated that the position of the boll on the plant did not seem to affect significantly the fibre characters except fibre maturity. Bottom bolls were found to possess somewhat longer fibres. Picking-wise, the first picking gave longer and mature fibres though bundle strength values did not show significant difference for G. Cot. 10; the bundle strength was higher for the first picking in the case of G. Cot. 11.

Identification of cotton varieties (grown at Cotton ;Research Station, Surat) with different levels of nep content and study of varietal variability and inheritance of the characteristics of neppiness in cotton showed that contribution to variance due to parents and hybrids was highly significant and the parents versus hybrids was not significant implying the absence of mean heterosis. Out of 28 hybrids studied, 16 exhibited negative heterosis. The intra-**barbadense** and **hirsutum-barbadense** crosses gave higher number of neps as compared to intra-**hirsutum** crosses.

In the study on comparative efficacy of diffierent synthetic pyrethroids for the control of boll worms on Hybrid 4 cotton conducted at GAU, Surat, it was observed that all treatments exhibited significant improvement in yield and oil content. Bundle tenacity at 3 mm gauge length and Micronaire fineness showed improvement in all treatments except those with permethrin (Ambush 20 EC) and Cypermethrin (Cymbush 25 EC), as compared to control.

In another trial on the 'Evaluation of Permethrin and Cypermethrin for the control of pest on Hybrid 4 cotton', all the treatments increased yield very significantly. 2.5% span length, bundle tenacity at 3 mm gauge length and Micronaire fineness also showed improvement in all treatments except that with permethrin (Ambush 50 EC).

A laboratory model Boll Toughness Tester has been fabricated. The test results on cotton bolls indicated that there exists wide variation of strength of cotton bolls among cotton varieties. This finding would help in selective breeding experiments with a view to produce pest resistant cotton bolls.

Developmental work has been carried out on a seed cotton cleaner to ensure the smooth flow of seed-cotton during the cleaning process.

An Optical Scanning Fibre Length Tester was designed and fabricated which roughly consumes 95 watts of power and can be operated on A.C. power of 230 V. Various long, medium and short staple varieties of cotton were tested on the machine and the test results were found to be well within the acceptable limits of accuracy.

With a view to ascertain whether any difference exists with different methods of calculation of Hermans Orientation factor, eight cottons, two from each of the species studied earlier were scanned and fx derived using 002 alone as well as 101, $10\bar{1}$ and 002 planes. The

results showed that the differences in fx values were within the range of experimental errors.

In connection with the studies on the inheritance of strength and structural parameters on cotton fibres, F_1 hybrids from the chosen parent samples were raised and ginning of **kapas** was underway.

For yarns with different counts and twists spun from a cotton, the 50% x-ray angle was found to correlate well with the maximum twist angle and yarn elongation. This parameter also correlated fairly well with yarn tenacity.

In the study on cotton fibre strength and its dependence on various morphological and structural parameters, it was observed that in every fifth fibre among the fibres in each variety, break occurred within a distance of 30 μ from a reversal during the tensile test. When the distance limit was relaxed to 100 μ the corresponding fibre number increased to about 2/3 of the total in each variety and thus it was evident that fibre rupture near the reversal was a significant event.

Examination of details of rupture under SEM on typical fibres selected on the basis of their linear density (ld) and breaking strength indicated that immature fibres broke during the tensile test giving sharp ruptured ends while moderate and high ld fibres showed either sharp or long ruptures depending on whether the fibre cross-section was near circular or highly collapsed. Fibres with high ld but low strength broke at points of inhomogeneity such as a sharp bend irregular section or sudden twist in the fibre.

Birefringence studies on thin sections of cellophane sheets before and after subjecting them to swelling and stretching treatments have shown that crystallinity and longitudinal orientation of molecular chain axes increased considerably by stretch. Glucose rings in the amorphous domains of cellulose films show a tendency for orientation parallel to the film surface.

A set of rayon filaments subjected to swelling and stretching treatments by a procedure evolved at CTRL exhibited considerable increase in crystallinity and crystallite orientation factor and birefringence though there was an initial drop in these quantities with slack treatment. Stretch during treatment evidently helped molecular orientation towards the direction of the fibre axis as well as crystallisation of the molecular chains. Further, fluidity determination showed that these treatments did not cause any degradation.

FQI computed from Digital Fibrograph parameters was better associated with CSP values than that determined using Baer Sorter parameters, although all the correlation values were highly significant.

The study on the influence of fibre length and fibre length distribution parameters on yarn quality showed a significant relationship between UR, FFI at 12.5%, 50% and U% for short staple cotton. In the case of long staple cottons, all the length distribution parameters had significant relationship with the values of imperfection. Compared to all other length distribution parameters, UR had better relationship with imperfections.

Studies on inverse relaxation phenomenon using polyester staple fibres showed that at initial levels of retraction, only stress relaxation was observed. At intermediate and high levels of retraction, stress relaxation accompanied with inverse relaxation and inverse relaxation alone, respectively, were observed. Thus the behaviour of staple fibres was the same as that observed for 100% polyester spun yarns.

On the basis of yarn properties of four cottons spun separately on Laxmi Rieter and SKF drafting systems on the ring frame as well as on the Open end Spintrainer, Virnar, AK. 235 and G. 6 were selected for further studies on them in blends of 50:30:20 (C5). 20:50:30 (C6) and 30:20:50 (C7). C5 and C7 gave slightly higher CSP than C6. For both 20s and 16s counts, C7 had better evenness values than the other blends, but no appreciable difference was noticed in the case of Open end spun yarns.

Regarding studies on optimal blending of standard varieties of cotton of Gujarat region, the varieties Varalaxmi, Sankar 4, 170 CO2, Digvijay, SRT. I CJ. 73 obtained from different areas have been taken up for individual evaluation.

Variation in blend composition along the length of viscose/polyester blended yarns at intervals of the order of fibre length was greater than the allowed range of ± 3% from the value obtained by chemical determination. However, the average of 20-25 such measurements made at intervals of fibre length was nearly the same as the actual blend composition. The CV% for the different individual tests was found to be dependent on the compatibility of linear density and length of the component fibres, and the least when the component fibres had equal staple lengths and the same denier values. Irrespective of fibre length and linear density of the components individual values of blend composition

for 40 cm segments taken successively, never exceeded ± 3% from the actual value indicating the absence of medium range variations in blend composition.

U% for NaOH and KOH treated yarn samples was higher for both 10s and 20s counts for all the concentrations of NaOH and KOH, irrespective of whether the treatment was carried out after dewaxing or with wetting agent, though there was no systematic trend in the change in U% with increase in the concentration of alkali. In general, increase in U% was slightly higher for KOH treated samples compared to corresponding samples treated with NaOH.

Test conducted on a few samples of blended fabrics to standardise Martindale Wear Tester in respect of the duration of the number of rubs required for pill formation and the choice of abradant to be used, indicated that on an average 2,000 to 3 000 rubs were sufficient for pill formation on the blended fabrics and that canvas would be the best choice for use as abradant.

A new technique evolved at CTRL gave higher percentage of graft in the case of methyl methacrylate and acrylonitrile when they were taken in a suitable solvent and applied onto the fabric followed by the addition of initiator solution. Since in the case of styrene only a minimum per cent (2%) graft was obtained, suitable modifications were being tried out to obtain higher per cent graft with styrene, as well.

When 16 cottons received from Crop Development Division, CICR were screened for response to easy-care finishing treatment T_3-11, K. 41, K. 44 and K. 46 strains were found to have good retention of tenacity and elongation. A short note relating CRA with DP was prepared based on the result obtained on drill, poplin, sheeting and satin fabrics which were treated with different concentrations of DMDHEU.

Fabrics received from a renowned mill of South India when given treatment with a new polymer reagent 'P' exhibited better flame proofing properties with practically no loss in strength.

Crossl'nking in the presence of a mixed catalyst system showed that samples treated in the presence of a mixture of aluminium sulphate and zinc acetate had marked increase in WRA, abration resistance and DP rating while breaking and treating strength were on the lower side as compared to control. Fabrics treated in the presence of aluminium sulphate and glycolic acid imparted gradual increase in resin add-on with increase in the glycolic acid component.

The electron diffraction pattern of continuously enzyme treated samples for 18 days and those on repeatedly enzyme treated sample, revealed spot pattern having 'd' spacings corresponding to those of cellulose I lattice.

The rate of hydrolysis of mercerised cotton was much faster producing 2150 μg/ml reducing sugar as against 180 μg/ml in the case of untreated cotton.

The transmission electron microscopy of enzyme treated mercerised cotton revealed long hydrocellulose-like particles after one day hydrolysis which were then further fragmented into spherical particles of size 3 μm at the end of enzyme hydrolysis of 3 days. Repeated enzyme treatment of mercerised cotton produced particles of size 400 A° to 600 A°.

Oil seed meals of castor, cotton, sesame black and sesame white were fractionated on the basis of their solubility in water, salt, alkali and alcohol. A study of the effect of these fractions when added to the medium for the production of amylase by **B. subtilis**-159 indicated that alcohol soluble fraction of each oilseed meal gave maximum amylase which was well comparable with whole oilseed meal. Further, using **B. subtilis**-159 amylase low viscosity starches as well as starch-based adhesives were also prepared.

Studies on antibiotic property of gossypol on some typical gram +ve and gram —ve organisms proved that only gram +ve organisms were susceptible to free gossypol toxicity.

Studies on Suvin variety showed that at the early stages of boll development the lint weight was not considerable; but it increased sharply after 25 days post-anthesis and continued upto 35 days post-anthesis while the lint length increased upto about 28 days post-anthesis, which implied that before the phase of cell wall elongation stopped, the phase of cell wall thickening started. Fractionation studies in developing seeds were repeated and four protein fractions were obtained on the basis of their solubility and the nitrogen contents of each fraction of the developing seeds were estimated. Gossypol content increased throughout seed development.

Semi-chemical and chemical pulp obtained from chips of about 2 cm length of cotton plant stalk by digesting in a comb digester, was bleached and standard size paper sheets were prepared, which were of good quality. The same were tested for various properties as per ASTM specifications.

SUMMARY OF THE REPORT

In spite of reducing the amount of NaOH to 0.1% with the addition of 1.5% lime and 15% innoculum from the point of view of obtaining culturally suitable biomanure, it was found that the yield of bio-gas produced from cotton willow-dust remained the same as in the earlier process. Besides about 8 m^3 of bio-gas was obtained in the subsequent 15 days of normal gas generation stage making the entire process viable for 45 days unlike 30 days of the earlier process.

Attempts made to grow **pleurotus sajor-caju** on willow-dust was not encouraging, presumably due to the competition of other microbes as the material was not pasteurised. About 100 kg. of compost prepared from willow-dust along with 10 kg. of anaerobically digested willow-dust slurry were sent to the Department of Microbiology P.A.U., Ludhiana to explore the possibilities of raising **Agaricus bisporus** and casing the same for mushroom crop respectively.

Marked effect of place was noticed on total oil content as well as of palmitic, palmitoleic and linoleic acids on the same variety of Hybrid 4 seeds grown at six different places.

Study on Laxmi cotton seeds from different stages of growth from 20 days to 70 days old cotton bolls exhibited marked increase in fat content after 30 days of growth. Oil content in seeds of 20 days old bolls increased from 2.10% to 20.15% in seeds of 40 days old bolls. Similarly myristic, palmitic, palmitoleic, stearic and linoleic acids showed marked change in bio-synthesis during growth periods.

Palmitic and stearic acids could be separated from the cotton seed oil by lead salt formation and fractional crystallation at — 15°C.

Experiments conducted to determine the contribution of different parts of cotton plant existing as trash in cotton linters towards ash and iron content showed that the presence of residual leaf bits might increase the ash content, whereas that of hulls contribute increase in iron content.

Particle boards were prepared from powdered cottonseed hull by keeping moisture content constant at 15% and using different concentrations of resin binder and catalyst as well as by keeping resin binder constant and varying the moisture content. The boards were of good quality and showed better strength and modulus of rupture with increase in resin content.

7. PERSONNEL

A. Appointments

Scientific Staff

Shri N. Ramesh Babu to the post of Scientist S-2 (with effect from 8.7.1983).

Technical Staff

Shri K. Natarajan to the post of Senior Technical Assistant, Grade T-4 (with effect from 4-8-1983), Kum. V. Annapurna to the post of Technical Assistant, Grade T-II-3 (with effect from 16-8-1983).

Administrative Staff

Shri U. A. Gupte to the post of Junior Clerk-Cum-Hindi Typist (with effect from 19-10-1983).

Supporting Staff

S/Shri Mohsin Ahmed Abdul Rashid to the post of supporting staff grade-I (Watchman) (with effect from 10-1-1983), C. S. Salvi (with effect from 5-2-1983), D. M. Raje (with effect from 10-3-1983), P. V. Jadhav (with effect from 14-3-1983), R. K. Pallewad (with effect from 24-3-1983), D. B. Temgire (with effect from 19-4-1983), N. V. Kambli (with effect from 2-9-1983), Smt. Birmo R. Taleram (with effect from 3-10-1983) and Shri C. P. Solanki (with effect from 10-10-1983), all to the post of Supporting Staff Grade-I.

B. Promotions

Shri D. L. Kalsekar to the post of Assistant Administrative Officer (with effect from 21-3-1983).

Sarvashri M. P. Juwale (with effect from 15-6-1983), F. C. Fernandes (with effect from 14-1-1983) and G. Sasidharan (with effect from 14-9-1983) to the post of Office Superintendent.

Shri V. M. Kasabe (with effect from 27-9-1983) and Mrs. M. V. Kamerkar (with effect from 16-9-1983) to the post of Assistant.

Shri E. T. Gurav to the post of Junior Clerk (with effect from 28-5-1983).

S/Shri Kammikkar Singh and H. N. Gawde (both with effect from 7-2-1983) to the post of Supporting Staff Grade III.

S/Shri G. G. Ambare, A. B. Sawant, Sanwarmal Saini, K. M. Rathod, V. Y. Unhalekar, T. B. Thapa, A. R. Bane, T. S. Mhaske, G. S. Deorukhkar, and S. L. Gawde, (all with effect from 21-3-1983) to the post of Supporting Staff Grade II.

C. Transfers

Scientific Staff

Smt. Vatsala Iyer, Scientist S-1 from Cotton Technological Research Laboratory (CTRL), Bombay to IARI, New Delhi alongwith her post (with effect from 21-8-1983).

Technical Staff

Shri S. N. Nagwekar, Jr. Quality Evaluation Officer, Grade T-5 from CTRL, Bombay to Quality Evaluation Unit (QE) of CTRL, Hissar (with effect from 17-1-1983) and again from Q.E. Unit of CTRL, Hissar to CTRL, Bombay (with effect from 11-7-1983).

Shri C. P. Venugopalan, Jr. Quality Evaluation Officer, Grade T-5 from Q.E. Unit of CTRL, Coimbatore to Q.E. Unit of CTRL, Hissar (with effect from 1-7-1983) and again from Q.E. Unit of CTRL, Hissar to Q.E. Unit of CTRL, Coimbatore (with effect from 29-9-1983).

Shri S. J. Guhagarkar, Sr. Technical Assistant, Grade T-4, from CTRL, Bombay to Q.E. Unit of CTRL, Hissar (with effect from 8-11-1983) for a period of six months.

Shri S. Sekar, Technical Assistant, Grade T-II-3 from Q.E. Unit of CTRL, Hissar to CTRL, Bombay (with effect from 11-1-1983).

Administrative Staff

Shri V. J. Antony, Assistant Accounts Officer, CTRL, Bombay to Central Institute of Research on Goats, Makhdoom (with effect from 27-5-1983).

Shri G. Sasidharan, Assistant from Q.E. Unit of CTRL, Surat to CTRL, Bombay (with effect from 30-5-1983).

Shri E. T. Gurav, Jr. Clerk, from CTRL, Bombay to Q.E. Unit of CTRL, Surat (with effect from 28-5-1983).

D. Retirements

S/Shri L. R. Jambunathan, Quality Evaluation Officer, Grade T-7 and V. Jose Joseph, Sr. Technical Assistant, Grade T-4, retired from

service, with effect from 31-3-1983 (superannuation) and 1-2-1983 (Voluntary), respectively.

Shri V. N. Wadhwani, Asstt. Administrative Officer, retired voluntarily from service with effect from 5-3-1983.

S/Shri R. P. Belamaddi and H. N. Gawde, Supporting Staff Grade III, retired from service (both with effect from 30-6-1983).

E. Resignations/Termination of services

S/Shri J. K. Gohel and M. Karmakar, Technical Assistant, Grade T-H-3, resigned from service with effect from 20-7-1983 and 6-8-1983, respectively.

Shri A. A. Gote, Electrician, Grade T-1, resigned from service with effect from 30-7-1983.

Shri H. G. Kini, Junior Clerk, resigned from service with effect from 11-2-1983.

The service of Shri G. N. More, Jr. clerk was terminated with effect from 7-3-1983.

F. Deputation Abroad

Shri M. S. Parthasarathy, Sr. Scientist was deputed as Project Leader to discuss collaborative research programmes under the Indo-UK Memorandum of Understanding on Natural Resources Research envisaged with Leicester Polytechnic, Leicester and Shirley Institute, Manchester, U.K., for a period of 17 days from 14-4-1983 to 1-5-1983. During this period he also visited the Textile Departments at University of Strathclyde, Glasgow, Huddersfield Polytechnic and Bolton Institute of Advanced Education.

S/Shri B. Srinathan, Scientist S-2 and K. S. Bhyrappa, Jr. Quality Evaluation Officer, Grade T-5, were deputed abroad for training in Knitting at Leicester Polytechnic, Leicester, U.K. for a period of ten months from 29-9-1983.

G. Assessments

Scientific Staff

The Five Yearly Assessment of the eligible scientific personnel of CTRL was carried out by the ASRB, and promotion/advance increments granted as follows :

Promotions

Sr. No.	Name	Grade to which promoted	Effective date of promotion
1.	Dr. S. N. Pandey	S-3 (Rs. 1500-2000)	1-7-1980
2.	Shri A. V. Ukidve	S-2 (Rs. 1100-1600)	1-7-1980
3.	Smt. K. L. Datar	S-1 (Rs. 700-1300)	1-7-1980
4.	Shri R. M. Gurjar	S-1 (Rs. 700-1300)	1-7-1980
5.	Smt. J. K. S. Warrier	S-1 (Rs. 700-1300)	1-7-1983

Advance Increments

Sr. No.	Name	Grade	No. of advance increments	Effective date of increments
1.	Shri D. N. Makwana	S	Three	1-7-1980

Technical Staff

The Five yearly Assessment of the eligible technical personnel of CTRL was held in December 1983 and promotions/advance increments granted as detailed below :

Promotions

Sr. No.	Name	Grade to which promoted	Effective date of promotion
1.	Shri C. P. Venugopalan	T-5 (Rs. 650-1200)	1-7-1983
2.	Shri B. S. Ganvir	T-5 (Rs. 650-1200)	1-7-1983
3.	Smt. R. K. Shahani	T-4 (Rs. 550-900)	1-7-1983
4.	Smt. A. A. Kathe	T-4 (Rs. 550-900)	1-7-1983
5.	Shri K. B. Rajagopal	T-4 (Rs. 550-900)	1-7-1983
6.	Shri R. S. Darade	T-4 (Rs. 550-900)	1-7-1983
7.	Shri S. Sekar	T-4 (Rs. 550-900)	1-7-1983
8.	Shri S. J. Guhagarkar	T-4 (Rs. 550-900)	1-7-1983
9.	Shri D. Radhakrishnamurthy	T-4 (Rs. 550-900)	1-7-1983
10.	Shri Purushottam Vira	T-I-3 (Rs. 425-700)	1-7-1983
11.	Shri P. K. Gopalan	T-2 (Rs. 330-560)	1-7-1983
12.	Shri Bechan Nokai	T-2 (Rs. 330-560)	1-7-1983
13.	Shri K. V. Nair	T-2 (Rs. 330-560)	1-7-1983
14.	H. K. Pawar	T-2 (Rs. 330-560)	1-7-1983

Advance Increments

Sr. No.	Name	Grade	No. of advance increments	Effective date of increments
1.	Shri A. W. Shringarpure	T-5	One	1-7-1983
2.	Shri R. Dwarkanath	T-5	One	1-7-1983
3.	Shri S. N. Nagwekar	T-5	Three	1-7-1983
4.	Shri A. K. Antony	T-5	Two	1-7-1983
5.	Shri M. C. Bhalod	T-4	Three	1-7-1983
6.	Shri S. Vancheswaran	T-II-3	Two	1-7-1983
7.	Shri R. S. Pathare	T-II-3	Two	1-7-1983
8.	Shri E. A. Pachpinde	T-II-3	Two	1-7-1983
9.	Shri I. H. Hunsikatti	T-II-3	Two	1-7-1983
10.	Shri R. B. Pawar	T-I-3	Three	1-7-1983
11.	Shri S. G. Dalvi	T-I-3	One	1-7-1983
12.	Smt. K. K. Kale	T-1	One	1-7-1983
13.	Shri M. M. Shaikh	T-I-3	One	1-7-1983
14.	Shri P. B. Gurjar	T-I-3	One	1-7-1983

H. Training

Dr. P. K. Chidambareswaran and Shri N. Ramesh Babu, both Scientists S-2 attended the training programme on Micro/Mini Computer Concepts and Basic Programming held from January, 3 to January 14, 1983 at Bombay by the Computer Maintenance Corporation, Bombay.

Dr. (Mrs.) P. Bhama Iyer, Scientist S-1, underwent three days training course in 'Infrared Spectroscopy', conducted from December 29 to December 31, 1983 by M/s Blue Star Ltd., Bombay.

Shri P. V. Varadarajan, Scientist S-1 attended the Summer Institute Training Course on Instrumentation Techniques for Agricultural Scientists conducted from June 13 to July 2, 1983 at the Department of Electrical Engineering, Punjab Agricultural University, Ludhiana.

8. APPENDICES

APPENDIX-I

Financial Statement

EXPENDITURE AND RECEIPTS OF LABORATORY DURING 1982-83

	Sanctioned Grant (Rs.)	Actual Expenditure (Rs.)	Saving(—) Deficit (+) (Rs.)
A. EXPENDITURE			
I. Cotton Technological Research Laboratory including Quality Evaluation Units of CTRL at Regional Stations (Non-Plan)			
(a) Capital expenditure including expansion of Laboratory	5,65,000	5,64,495	(—)505
(b) Working expenditure	49,07,000	49,07,208	(+)208
	54,72,000	54,71,703	(—)297
II. Scheme for modernisation and strengthening of CTRL for intensive research on cotton (Plan)	56,25,000	56,24,268	(—)732
III. Integrated Cotton Development Project	—	26,375	(+)26,375

B. RECEIPTS

	(Rs.)
Analytical & Testing Fees	29,603
Rent	93,992
Fees for training, application fees, etc.	9,376
Receipts from service rendered by the Institute	5,100
Sale of publications	3,841
Interest on loans and advances granted to Council's employees	416
Leave Salary & Pension Contribution	1,936
Refund of Customs duty from DGS & D, Bombay in March, 1983	8,75,000
Miscellaneous receipts (including sale of mixed cotton waste)	53,366
	10,72,630

APPENDIX – II

Staff working at Cotton Technological Research Laboratory, Bombay as on 31-12-1983.

(List does not include vacant posts)

A. At CTRL, Bombay

Director : Dr. V. Sundaram, M.Sc., Ph.D., F.T.I., C.Chem. M.R.S.C.

Scientific Staff

Designation	Grade	Name
Scientist (Physics)	S-3	Dr. N. B. Patil, M.Sc., Ph.D.
,, (Spinning Technology	,,	Shri M. S. Parthasarathy, M. Text. (Bom.), M.Sc. Tech. (Manch.), A.M.C.S.T.
,, (Physics)	,,	Dr. V. G. Munshi, M.Sc., Ph.D., F.T.A.
,, (Chemistry)	,,	Dr. S. N. Pandey, M.Sc., Ph.D.
,, ,,	S-2	Kum. I. G. Bhatt, M.Sc.
,, (Electronics & Instrumentation)	,,	Shri N. Ramesh Babu, B.E., M. Tech.
,, (Fibre Technology)	,,	Shri T. N. Ramamurthy, B.Sc. B.Sc. (Tech.)
,, (Microbiology)	,,	Dr. V. G. Khandeparkar, M.Sc., Ph.D.
,, (Physics)	,,	Dr. P. K. Chidambareswaran, M.Sc., Ph.D.
,, ,,	,,	Dr. K. R. Krishna Iyer, M.Sc., Ph.D.
,, ,,	,,	Shri P. G. Oka, M. Sc.
,, ,,	,,	Shri A. V. Ukidve, M.Sc.
,, (Statistics)	,,	Shri G. S. Rajaraman, M.A.
,, (Textile Manufacture)	,,	Shri B. Srinathan, B.Sc. (Text.)
,, (Biochemistry)	S-1	Smt. S. P. Bhatawdekar, M.Sc.
,, ,,	,,	Shri S. G. Gayal, M.Sc.
,, ,,	,,	Smt. G. Revathi, M.Sc.
,, (Biophysics)	,,	Dr. K. M. Paralikar, M.Sc., Ph.D. F.R.M.S.
,, (Chemistry)	,,	Shri S. Aravindanath, M.Sc.
,, ,,	,,	Shri R. M. Gurjar, M.Sc.
,, ,,	,,	Smt. Prema Nair, M.Sc.
,, ,,	,,	Kum. C. R. Raje, M.Sc.
,, ,,	,,	Shri A. J. Shaikh, M.Sc.
,, ,,	,,	Shri P. V. Varadarajan M.Sc.
(Farm Machinery and Power)	S-1	Shri U. N. Borkar, B.Sc. (Agri.), B.Sc. (Agril. Engg.), M. Tech.
,, (Microbiology)	,,	Dr. R. H. Balasubramanya, M.Sc., Ph.D.
,, ,,	,,	Kum. A. S. Dighe, M.Sc.
,, (Organic Chemistry)	,,	Shri L. K. Suri, M.Sc.
,, (Physics)	,,	Shri G. F. S. Hussain, M.Sc.
,, ,,	,,	Dr. (Smt.) P. Bhama Iyer, M.Sc. Ph.D.
		Shri R. P. Nachane, M.Sc.
,, ,,	,,	Dr. S. Sreenivasan, M.Sc. Ph.D.
,, ,,	,,	Dr. N. C. Vizia, M.Sc., Ph.D.
,, (Quality Evaluation)	,,	Shri A. K. Gupta, M.Sc., LL.B., W.P.M.M.T.
	,,	Shri B. M. Petkar, M.Sc.
,, ,,	,,	Smt. K. L. Datar, M.Sc.
,, ,,	,,	Smt. J. K. S. Warrier, M.Sc.

APPENDICES

Designation	Grade	Name
Scientist (Statistics)	S-1	Smt. Janaki K. Iyer, M.Sc.
,, (Textile Manufacture)	,,	Shri Muntazir Ahmed, B.Sc., B.Sc. (Text.)
,, (Chemistry)	S	Shri K. H. Sawakhande, M.Sc.
,, (Physics)	,,	Shri G. S. Patel, M.Sc.
,, (Quality Evaluation)	,,	Shri P. Bhaskar, M.Sc.
,, ,,	,,	Shri D. N. Makwana, M.Sc.
,, (Statistics)	,,	Shri D. V. Mhadgut, M.Sc.
	Technical Staff	
Technical Officer (Quality Evaluation)	T-6	Shri M. S. Sitaram, B.Sc.
,, (Electrical Engineer)	,,	Shri H. V. Gangar B.E. (E.) Grad. I.E.T.E.
Junior Quality Evaluation Officer	T-5	Shri K. S. Bhyrappa, L.T.T., A.T.A.
,,	,,	K. Chandran, B.A.
,,	,,	Shri S. Chandrasekhar, L.T.M., A.T.A.
,,	,,	Shri S. R. Ganatra, M.Sc.
,,	,,	Shri B. S. Ganvir, B.Sc.
,,	,,	Kum. I. K. P. Iyer, B.Sc.
,,	,,	Shri H. R. Laxmivenkatesh D.T.T., A.T.A.
,,	,,	Shri S. N. Nagwekar, B.Sc.
,,	,,	Smt. S. D. Pai, M.Sc.
,,	,,	Shri A. W. Shringarpure, B.Sc.
,,	,,	Shri N. Thejappa, M.Sc.
Technical Information Officer	,,	Shri T. K. M. Das, B.Sc., D.B.M., Dip. J.,D.P.R., DEIM, Cert. ISRS.
Senior Technical Assistant (Civil Engineering)	T-4	Shri K. Natarajan, Dip. Civil Engineering (Structure)
,, (Library)	,,	Smt. R. K. Sahani, B.Sc., B. Lib.
,, (Microbiology)	,,	Smt. A. A. Kathe, B.Sc.
,, (Photography)	,,	Shri R. M. Modi, S.S.C. (Certificate in photography)
,, (Quality Evaluation)	,,	Shri K. V. Ananthakrishnan, B.Sc., D.B.M.
,, ,,	,,	Smt. R. P. Bhatt, B.Sc.
,, ,,	,,	Smt. P. A. Dabholkar, B.Sc.
,, ,,	,,	Shri S. J. Guhagarkar, B.Sc.
,, ,,	,,	Shri C. R. S. Moni Iyer, B.Sc.
,, ,,	,,	Shri D. Radhakrishna Murthy, M.Sc.
,, ,,	,,	Smt. N. D. Nachane, B.Sc.
,, ,,	,,	Shri K. B. Rajagopal, B.Sc.
,, ,,	,,	Shri S. Sekar, B.Sc.
,, ,,	,,	Smt. S. V. Sukhi, B.Sc.
,, ,,	,,	Shri V. B. Suryanarayanan, B.Sc.
,, ,,	,,	Shri G. Viswanathan, B.Sc., A.T.A.
,, (Refrigeration)	,,	Shri V. V. Kshirsagar
Technical Assistant (Microbiology)	T-II-3	Kum. V. Annapurna, B.Sc.
,, (Quality Evaluation)	,,	Shri S. M. Gogate, B.Sc.
,, ,,	,,	Shri I. H. Hunsikatti, B.Sc., A.T.A.
,, ,,	,,	Smt. S. R. Kamath, B.Sc,
,, ,,	,,	Shri P. K. Mandhyan, B.Sc.
,, ,,	,,	Shri E. A. Pachpinde, B.Sc.
,, ,,	,,	Shri R. S. Pathare, B.Sc.

Designation	Grade	Name
Technical Assistant	T-II-3	
(Quality Evaluation)	,,	Shri N. Ramanathan, B.Sc.
,, ,,	,,	Shri S. Vancheswaran, B.Sc.
,, (Spinning)	,,	Shri H. Sengupta, B.Sc. (Part I) Dip. Text. Tech.
Draughtsman	T-I-3	Shri P. B. Gurjar
Electrician	,,	Shri R. B. Pawar
Fitter (Mechanical Processing)	,,	Shri Purushottam Vira
Laboratory Assistant	,,	Shri N. O. Anthony
Carpenter	T-2	Shri G. D. Narkar
Driver	,,	Shri S. S. Patekar
Fitter (Mechanical Processing)	,,	Shri P. K. Gopalan
Plumber	,,	Shri H. B. Tambe
Senior Operator (Mechanical Processing)	,,	Shri P. J. Ahire
,,	,,	Shri R. A. Dalvi
,,	,,	Shri Bechan Nokai
	,,	Shri H. K. Pawar
Driver	T-1	Shri P. C. Dutta
,,	,,	Shri B. B. Gaykar
Laboratory Assistant	,,	Shri S. B. Kamble
Senior Operative (Mechanical Processing)	,,	Shri D. B. Gadankush
,,	,,	Shri S. G. Shinde
Telephone Operator	,,	Smt. K. K. Kale

Administrative Staff

Administrative Officer	Shri P. Ramamurthy, B.A.
Asstt. Administrative Officer	Shri D. L. Kalsekar
Superintendent	Shri M. P. Juwale
,,	Shri F. C. Fernandes
,,	Shri G. Sasidharan, B.A.
Assistant	Shri K. S. Deshpande
,,	Shri D. P. Naidu
,,	Shri K. Sudhakaran
,,	Shri D. J. Raut
,,	Smt. V. V. Gore, B.A.
,,	Smt. S. S. Dongare, B.A.
,,	Shri G. Moosad, B.Com.
,,	Shri P. D. Sonawane, B.A.
,,	Smt. Jayagouri Sivaramakrishnan
,,	Shri M. Z. Bhagat
,,	Shri V. M. Kasabe
,,	Smt. M. V. Kamerkar, B.A.
,,	
Stenographer	Shri Venu Thanikal
Junior Stenographer	Smt. K. Chellamma Damodaran
,,	Kum. V. T. Bhuwad, M.A.
,,	Kum. T. A. Rodrigues
Senior Clerk	Smt. Veena Kotwani, B.A.
,,	Shri K. W. Khamkar, B.A.
,,	Shri B. D. Sawant
,,	Shri A. B. Dalvi
,,	Shri S. N. Salve
,,	Shri D. G. Kulkarni
Junior Clerk	Smt. S. S. Shanbhag
,,	Shri K. N. Iyer
,,	Smt. V. V. Desai
,,	Smt. S. D. Ambre

APPENDICES

Designation	Name
Junior Clerk	Smt. S. M. Desai
,,	Shri J. J. Karanjavkar
,,	Shri A. P. Natu
,,	Kum. Sujatha G. Nayar
,,	Shri M. Sarkar
(Hindi Typist)	Shri U. A. Gupte, B.Com.
	Auxiliary Staff
Hindi Translator	Smt. K. R. Joshi, M.A.
	Supporting Staff
Grade IV	Shri M. M. Rupawate
,,	Shri K. D. Mohite
,,	Shri R. G. Chiplunkar
,,	Shri P. G. Kadam
Grade III	Shri K. K. Kasar
,,	Shri T. R. Kadam
Grade II	Shri Obilal Parsuram
,,	Shri R. R. Khurdekar
,,	Shri Babu Aba Babar
,,	Shri Ratansingh Gussain
,,	Shri Chatrapal Mhatri
,,	Shri S. V. Patil
,,	Shri M. R. Nevrekar
,,	Shri G. G. Ambare
,,	Shri A. B. Sawant
,,	Shri V. Y. Unhalekar
,,	Shri T. B. Thapa
,,	Shri A. R. Bane
,,	Shri T. S. Mhaske
,,	Shri G. S. Deorukhkar
,,	Shri S. L. Gawde
,,	Shri M. B. Thokrul
Grade I	Shri Shamji Waghela
,,	Shri B. K. Sawant
,,	Shri Butnislal Balmiki
,,	Shri N. J. Kharat
,,	Shri R. B. Jadav
,,	Shri S. M. Sawant
,,	Shri M. Y. Chandanshive
,,	Shri B. R. Jadhav
,,	Shri M. B. Gurve
,,	Shri N. R. Kamble
,,	Shri A. R. Gujar
,,	Shri M. B. Chandanshive
,,	Shri O. T. Thapa
,,	Shri B. R. Satam
,,	Shri D. M. Chaugule
,,	Smt. T. V. Bhowar
,,	Shri S. D. Gurav
,,	Shri M. K. Ghadge
,,	Shri M. Z. Rathi
,,	Shri Narayan Singh
,,	Shri C. S. Salvi
,,	Shri D. M. Raje
,,	Shri P. V. Jadhav
,,	Shri D. B. Temgire
,,	Shri N. V. Kambli
,,	Smt. Birmo R. Taleram
,,	Shri C. P. Solanki

B. QUALITY EVALUATION UNITS OF COTTON TECHNOLOGICAL RESEARCH LABORATORY

Station	Technical Officer Grade T-6	Jr. Quality Evaluation Officer Grade T-5	Sr. Technical Assistant Grade-4	Scientist Grade S	Technical Assistant Grade T-II 3
1	2	3	4	5	6
Akola	—	—	—	—	Kum. Vishala S. Ayyar
Coimbatore	—	Shri A. K. Antony, B.Sc. Smt. Santa V. Nayar, B.Sc. Shri C. P. Venu-gopalan, B.Sc.	—	—	—
Dharwad	—	Shri E. S. Abraham, B.Sc.	—	—	Shri M. T. Danolli, B.Sc.
Guntur	—	Shri R. Dwarka-nath B.Sc.	—	—	Shri S. Mukundan, B.Sc.
Hissar	—	—	—	—	—
Indore	—	—	—	Shri S. B. Jadhav, M.Sc.	—
Ludhiana	—	—	—	—	Shri V. K. Madan, M.Sc.
Nagpur	—	—	—	—	Shri V. M. Kulmethe, B.Sc. Shri P. L. Meshram, B.Sc.
Nanded	—	—	—	Shri L. D. Deshmukh, M.Sc.	Shri N. V. Bansode, B.Sc.
Rahuri	—	—	Shri R. S. Darade, B.Sc.	—	—
Sriganga-nagar	Shri Ram Prakash, B.Sc.	—	—	—	—
Surat	—	—	Shri M. C. Bhalod B.Sc.	Shri Y. Subra-manyam, M.Sc.	Shri G. G. Mistry, B.Sc.

Senior Operative Grade T-2	Senior Operative Lab. Asstt. Grade T-1	Junior Clerk	Supporting Staff Grade III	Supporting Staff Grade II	Supporting Staff Grade I
7	8	9	10	11	12
—	—	—	—	—	—
Shri K. V. Nair	—	—	Shri N. Arumugham	Shri V. M. Subramaniam	—
—	—	—	—	Shri Y. R. Sone	—
—	—	—	Shri Ch. Thimmanna	—	Shri V. Y. H. Suvarchala Rao
—	—	—	—	Shri Gian Singh	—
—	Shri Sunil Sharma, B.Sc.	—	—	Shri Harisingh Babar Shri John Robert	—
—	—	—	Shri Kamikkar Singh	—	—
—	—	—	—	—	Shri Satyanarayan Gop Shri Mohsin Ahmed Shri M. P. Thokar
—	—	—	—	Shri L. R. Indarkar	—
—	—	—	—	—	—
—	—	—	Vijendra Singh	—	Shri Sanwarmal Saini
—	—	Shri E. B. Gurav	Shri J. B. Dhodia	Shri K. M. Rathod	—

APPENDIX-III

Statement Showing the Total Number of Government Servants and the Number of Scheduled Castes and Scheduled Tribes Amongst them as on December 31, 1983

Group/Class	Permanent / Temporary	Total Number of employees	Scheduled Castes	Percentage of total employees	Scheduled Tribes	Percentage of total employees	Remarks
Gr. A. (Cl. I) Permanent							
(i) Other than lowest rung of Cl. I		16	—		—	—	—
(ii) Lowest rung of Cl. I		20	1		—	—	—
Total :		36	1	3%			
Temporary							
(i) Other than lowest rung of Cl. I		—	—		—	—	—
(ii) Lowest rung of Cl. I		8	1		—	—	—
Total :		8	1	12.5%			
Gr. B. (Cl. II)	Permanent	31	2	8%	—	—	—
	Temporary	17	2		—	—	—
Gr. C. (Cl. III)	Permanent	35	4	14%	1	1%	—
	Temporary	42	7		—	—	—
Gr. D. (Cl. IV)	Permanent	40	10	20%	3	5%	—
(excluding Sweepers)	Temporary	20	2		—	—	—
Gr. D. (Cl. IV)	Permanent	3	3	100%	—	—	—
(Sweepers)	Temporary	4	4		—	—	—

NOTE : 1. *This statement relates to persons and not to posts. Posts vacant etc. need not therefore, be taken into account.*

2. *A person on deputation has been included in the establishment of the borrowing Ministry/Deptt./Office and not in the parent office.*

3. *Persons permanent in one grade but officiating or holding temporary appointment in the higher grades have been shown in the figures relating to the class of service in which the higher grade concerned is shown.*

APPENDIX – IV

Statement Showing the Total Number of Reserved Vacancies filled up by Members of Scheduled Castes and Scheduled Tribes during the year 1983

Class of post	Total No. of vacancies		No. of vacancies reserved		Scheduled Castes						Scheduled Tribes				Remarks
	Notified	Filled	Out of Col. 2	Out of Col. 3	No. of SC candidates appointed	No. of SC vacancies carried forward from the previous year	No. of ST candidates appointed against vacancies reserved for SCs in the 3rd year of carry forward	No. of reservations lapsed after carrying forward for three years	No. of vacancies reserved Out of Col. 2	No. of vacancies reserved Out of Col. 3	No. of ST candidates appointed	No. of ST vacancies carried forward from the previous year	No. of SC candidates appointed against vacancies reserved for STs in the 3rd year of carry forward	No. of reservations lapsed after carrying forward for three years	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I — Posts filled by direct recruitment															
Others Class I	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lowest rung of Class I	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Class II	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Class III	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Class IV (Excluding Sweepers	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Class IV (Sweepers)	2	2	2	2	2	—	—	—	—	—	—	—	—	—	—

— Table Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
						II — Posts filled by promotion									
Others Class I	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lowest rung of Class I	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Class II	4	4	1	1	1	—	—	—	—	—	—	—	—	—	—
Class III	3	3	—	—	—	1	—	—	—	—	—	—	—	—	—
Class IV (Excluding Sweepers)	12	12	2	2	2	—	—	—	—	—	—	—	—	—	—
Class IV (Sweepers)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE : (1) *Consolidated figures have been given under each group (Class).*

(2) *In Columns 4, 5, 9 and 10 the number of vacancies actually reserved out of Columns 2-3 whether against brought forward reservations or against normal reservations during the year have been given.*

(3) *In the case of promotions by selection from Group C, Group B within Group B and from Group B to the lowest rung of Group A. (Class III to Class II, within Class, II and from Class II to the lowest rung of Class I). The words "in the third year of carry-forward" in the heading of Columns 7 and 12 and the words "after carrying forward for three years" in the heading of Columns 8 and 13 will not be applicable and these Columns may be filled accordingly. (C. F. Department of Personnel and A. R. Office Memorandum Nos. 10/41/73-Estt(SCT) dated the 20th July, 1974, 10/37/74-Estt. (SCT), dated the 3rd February, 1975 and 1/9/74-Estt (SCT) dated the 29th April, 1975).*

Certified that in the case of reserved vacancies wherever non-Scheduled caste/tribe candidates were appointed (a) Prior approval of the Department of Personnel and Administrative Reforms was obtained in the case of vacancies included in the roster for permanent appointments and temporary appointments likely to become permanent or continue indefinitely and (b) in the case of purely temporary appointments the steps prescribed in para 8.1 of Brochure on the Reservations for Scheduled Castes and Scheduled Tribes in Services, were taken to secure scheduled caste/scheduled tribe candidates.

9. ANNEXURES

ANNEXURE-I

New Equipments Purchased During 1983

1. Microprocessor Computing System
2. Tairo Miniature Carding Machine
3. Tairo Miniature Draw Frame
4. Tairo Miniature Spindle Roving Frame
5. Toshniwal Strobometer
6. Unispinner Ring Spinning Tester.

ANNEXURE-II

Distinguished Visitors

1. Dr. V. G. Cheremisionov
   Assistant Agricultural Attache
   USSR Embassy in India
   New Delhi.

2. Shri E. B. Dissanaike
   Govt. Analyst and Director of the Textile Service & Training Centre
   Sri Lanka.

3. Dr. A. B. Joshi
   Ex. Vice-Chancellor
   Mahatma Phule Krishi Vidyapeeth
   Rahuri, Ahmednagar.

4. Mr. Fred Gillham
   Head, Technical Information Section I.C.A.C.
   1225, 19th Street N W 320
   Washington, D.C., U.S.A.

5. Dr. R. Nagarcenkar
   Director
   Central Sheep & Wool Research Institute
   Avikanagar.

6. Mr. Host Beator
   Head, Cotton Classers of the Breman Cotton Exchange
   West Germany.

7. Dr. P. G. Smith
   Department of Textile Industries
   University of Leeds
   London.

8. Shri Madhusudan Vairale, M.P.
   Chairman, COPU.

9. Dr. Mohamed El. Maghazi
Director
Cotton Research Institute
Giza, Egypt.

10. Dr. Mohamed El Abdul-Salam
Head, Cotton Spinning Research Section
Giza, Egypt.

11. Dr. Mohamed E. El-AKKad
Head, Cotton Physiology Research Section
Giza, Egypt.

12. Dr. John B. Villenguve
Consultant, Textile Projects to the World Bank.

13. Dr. Schwendihan Jacques
IRCT, Working for FAO
IBPGR.