Cotton Technological Research Laboratory

Indian Council of Agricultural Research

Annual Report

1975

BOMBAY

Cotton Technological Research Laboratory

Indian Council of Agricultural Research

Annual Report

1975

BOMBAY

Contents

Printed : December, 1976

Published by Dr. V. Sundaram, M.Sc., Ph.D., A.R.I.C., F.T.I., Director,
Cotton Technological Research Laboratory, Bombay 400 019, and
Printed by Msgr. Theodore A. Pereira, at the Examiner Press, Bombay 400 023.

I. Introduction

This is the 52nd Annual Report of the Cotton Technological Research Laboratory (CTRL) and covers the calendar year 1975.

This Laboratory was founded by the Indian Central Cotton Committee (ICCC), in 1924, in view of the essential need for an authoritative and scientific estimation of the inherent quality of the new varieties of cotton evolved. It came under the administrative control of the Indian Council of Agricultural Research (ICAR) from the 1st April, 1966, on the abolition of the ICCC. Since then, the research activities have been re-oriented and intensified. Many sophisticated equipments, like x-ray diffraction unit, infrared spectrophotometer, electron microscope, etc., have been added and this Laboratory has now excellent facilities for carrying out basic research studies in fibre structure. Research efforts of the Scientists at the CTRL will be continued as in the past, to help the grower in producing more and better quality cottons, as also in enhancing the utilisation of cotton lint and cotton plant by-products, and thus improve the economy of the country.

The chief functions of this Laborarory are :

(*i*) to actively participate in the programmes for improvement in production and quality of cotton in India, by evaluating the quality of new strains evolved by the agricultural scientists;

(*ii*) to carry out research on the physical, structural and chemical properties of cotton in relation to quality and spinning performance;

(*iii*) to carry out research investigations on the ginning of cotton;

(*iv*) to investigate the greater and better utilisation of cotton, cotton waste, linters, cottonseed, etc.;

(*v*) to help the trade and industry by furnishing true valuation of different trade varieties cultivated;

(*vi*) to issue authoritative reports on the samples received for tests from the government departments, the trade and other sources; and

(*vii*) to collect and disseminate technical information on cotton.

This Laboratory maintains a good up-to-date library of books on cotton technology. At the end of 1975, there were 3,079 books, 102 of which were

added during the year. The number of bound volumes was 2,876. The library received regularly about 190 journals dealing with textiles and allied subjects, 81 of which were subscribed for and others received on exchange or complimentary basis.

New Equipments Purchased

The list of equipments acquired for the use of the Laboratory during the year is given in Annexure I.

Management Committee

Under Rule 66(a) of the Revised Rules of the Indian Council of Agricultural Research, the Council constituted on the 25th October, 1975, a Management Committee for the Cotton Technological Research Laboratory, Bombay, consisting of the following persons as members :

1.	Dr. V. Sundaram, Director, Cotton Technological Research Laboratory, Bombay.	:	*Chairman*
2.	Dr. M. A. Tayyab, Senior Cotton Specialist, All India Coordinated Cotton Improvement Project, Punjabrao Krishi Vidyapeeth, Akola.	:	*Member*
3.	Dr. N. P. Mehta, Cotton Specialist, Surat (Gujarat).	:	*Member*
4.	Dr. P. V. Salvi, Dean (Agriculture), Konkan Krishi Vidyapeeth, Dapoli (Maharashtra).	:	*Member*
5.	Shri C. S. Sridharan, Assistant Director General (Engg.), Indian Council of Agricultural Research, New Delhi.	:	*Member*
6.	Dr. S. M. Betrabet, Senior Microscopist and Head of Microscopy & Microbiology Division, Cotton Technological Research Laboratory.	:	*Member*
7.	Dr. N. B. Patil, Senior Physicist and Head of Physics Division, Cotton Technological Research Laboratory.	:	*Member*

8.	Dr. V. G. Munshi, Senior Testing Technologist, I/C of Quality Evaluation Division, Cotton Technological Research Laboratory.	:	*Member*
9.	Shri B. Srinathan, Spinning Technologist, Cotton Technological Research Laboratory.	:	*Member*
10.	Shri D. S. Singh, Senior Accounts Officer, Indian Grassland and Fodder Research Institute, Jhansi, U.P.	:	*Member*
11.	Shri D. K. Mukerji, Administrative Officer, Cotton Technological Research Laboratory.	:	*Member-Secretary*

The tenure of the members of the Management Committee of the Cotton Technological Research Laboratory, Bombay, will be for three years with effect from the 23rd September, 1975.

The first meeting of the Management Committee was held on the 23rd December, 1975. The Committee considered the Fifth Plan proposals of the CTRL as well as the annual plan estimates for 1976-77. In addition, the current research programme of the CTRL and the progress made under various heads were also reviewed.

Central Institute for Cotton Research

At present, there is no research institute in the country devoted entirely to research on cotton breeding and allied subjects. The work is carried out in a number of Agricultural Universities and State centres either under the All India Coordinated Cotton Improvement Project (AICCIP) sponsored by the ICAR or under schemes sponsored by the Agricultural Universities and the State Governments. With the initiation of the All India Coordinated Research Project on Cotton, there has been considerable increase in the tempo of research on all aspects relating to improvement in the production and quality of cotton. As a result of the coordinated project in which scientists of various disciplines in the Agricultural Universities, Central Institutes like the Indian Agricultural Research Institute (IARI) and its Regional Stations at Sirsa and Coimbatore as well as of the CTRL take part, about 25 new varieties and hybrids have been released during the last eight years and recommendations have been made on important agronomic practices and general plant protection schedules. This has naturally changed the entire pattern of cultivation of cotton in India and its dependence on import of cotton has not only been reduced, but the country has started exporting cotton of the long staple varie-

ties. However, the results achieved so far should not make us complacent as the demand for cotton fibre is expected to grow tremendously during the next decade.

The production goals set for the next 30 years can be realised only by intensifying the research efforts further to achieve both quantitative and qualitative improvements. The Coordinated Cotton Improvement Project sponsored by the ICAR has so far contributed mainly to the breeding and testing of new varieties and cognate agronomic and plant protection work for realising high yields from the newly released varieties. It is, however, necessary to provide basic support to the cotton improvement programme, the results of which will be utilized for applied work under the Coordinated Project. There is a distinct lacuna in this field now, since long-term basic and fundamental research on cotton is not being carried out by any of the Institutions. It was, therefore, felt necessary to have a permanent set up under the ICAR in the form of an Institute for Cotton Research to carry out basic and fundamental work on cotton improvement.

The Central Institute for Cotton Research (CICR) which is being established at Nagpur in the Vidarbha tract of Maharashtra, the largest cotton growing tract of India, will carry out fundamental and basic path-breaking research to meet the long-term objectives of stepping up cotton production both quantitatively and qualitatively. The results which flow from the Institute's programme of fundamental research will form the basis for applied research under the All India Coordinated Cotton Improvement Project.

The Punjabrao Krishi Vidyapeeth has given 25 acres of land for the establishment of the Institute, while the Government of Maharashtra has given over 100 acres of land at the Panjari Parsodi Taluka Seed Multiplication Farm for establishment of the research farm.

The Regional Station of the Indian Agricultural Research Institute at Coimbatore which is now housing the coordination unit of the AICCIP will also be integrated with the new Institute and will function as the Regional Station of the CICR. The Institute will also work in close cooperation with the Cotton Technological Research Laboratory and the Punjabrao Krishi Vidyapeeth.

The Project proposals sanctioned for the new Institute involve an outlay of about Rs. 76 lakhs during the Fifth Plan period.

Dr. V. Sundaram, Director of CTRL, will be functioning as Director of CICR also till the new post is regularly filled up.

Distinguished Visitors

Shri Shah Nawaz Khan, Union Minister of State for Agriculture and Irrigation, visited the Laboratory on the 6th June, 1975, and was shown the working of the various sections. He envinced keen interest in the work in progress and had discussions with various Scientists.

Dr. M. S. Swaminathan, Director General, ICAR, Dr. A. B. Joshi, Director, IARI, Shri K. P. Singh, Secretary, ICAR, Dr. V. Santhanam, Project Coordinator (Cotton), and Dr. K. V. Srinivasan, officiating Project Coordinator (Cotton) visited this Laboratory in connection with official work.

A list of other distinguished persons, who visited this Laboratory during the year under review, is given in Annexure II.

Staff Research Council

During the year 1975, three meetings of the Staff Research Council (SRC) were held, as detailed below :

The first meeting was held on the 6th February, 1975, for finalising the programme of research work for the year 1975. The second meeting was held on the 21st June, 1975. In this meeting, discussions took place on the decisions taken at the meeting of the Directors of ICAR Institutes held in May, 1975, and also about the budget provision for 1975-76. Another subject of importance discussed was the proposed Agricultural Research Service and the proforma prepared by the Agricultural Scientists' Recruitment Board (ASRB) for screening the existing scientific staff. At the same meeting the progress made in various research projects was briefly discussed and particular mention was made of the important results obtained under the project on "Production and Characterization of Cellulases", viz., that the cellulase of *Penicillium funiculosum* was capable of breaking the structural backbone of Tamarind Kernel Powder (TKP) and efficiently removing LTKP sizing. The fabric strength after desizing remained the same as that of chemically desized fabric. Director suggested in the same meeting that, since the modification of the processing system of the Laboratory had been changed during the last two years, the Mechanical Processing Division should take up projects entitled "Comparison of different systems for processing cotton samples" and "Fixation of suitable strength standards for estimation of spinning performance of improved varieties", on a priority basis.

The third meeting was held on the 31st December, 1975. The progress of various research projects was discussed in detail. In this meeting it was decided that as fresh recruitments will be made only through ASRB examinations after March, 1976, the order of priority for projects should be drawn up and the available staff should be put to use judiciously so that important projects were not held up. Director also explained the decisions taken at the first meeting of Management Committee held on the 23rd December, 1975.

Inter-Institutional Projects

The following two research projects are in operation at this Laboratory in collaboration with the Jute Technological Research Laboratory (JTRL) and the Central Sheep and Wool Research Institute (CSWRI).

1. Studies on spinning from blends of cotton with wool, jute and ramie on cotton system.
2. Studies on de-burring of raw wool using mechanical devices.

Although the first project was started from the 1st December, 1973, it could not make much headway until June, 1975, due to delay in appointment of the required staff. However, with the appointment of the Spinning Technologist in July, 1975, the work on this project has now started in right earnest. Trials were carried out by microspinning on jute caddies to investigate the possibility of blending jute caddies with cotton. The project is now making steady progress.

The second project was activated in April, 1974. Preliminary experiments were carried out on wool samples of different burrs and vegetable matter contents on Laboratory Gin by making certain adjustments and modifications in the settings and parts, etc. In order to conduct large scale trials on the raw wool samples, a commercial single roller gin has been purchased from a local firm. The work of installation of this gin is in progress. The post of Senior Research Assistant sanctioned for this project has not been filled up so far due to ban on recruitment and the inadequacy of staff has hampered the progress of the work.

In addition to the above two projects, the ICAR sanctioned in October, 1973, one more research project entitled, "Optimal blending of standard varieties of Indian cottons" to be undertaken at this Laboratory. However, it has not been possible to start the work on this project as the required staff sanctioned to conduct it has not yet been appointed.

An inter-institutional three-year collaborative project entitled, "Studies on the production and utilization of chitosan and allied products from prawn shell waste" has been sanctioned by the ICAR. The institutions collaborating are Central Institute of Fisheries Technology (CIFT), Cochin, CTRL, and Bombay Textile Research Association (BTRA), Bombay. CIFT will be responsible for producing the chitosan, whereas CTRL and BTRA will explore the possibilities of utilization of chitosan in the textile industry, production of chitinase, etc. The work on this project has not yet been started at this Laboratory as the post of Junior Scientist (Microbiology) sanctioned for the project has not been filled up so far.

Membership on Other Organisations

The Director and other Scientific Officers of the Laboratory continued to represent the ICAR and CTRL on various Committees and Institutions, such as the Executive Council of Mahatma Phule Krishi Vidyapeeth, various Sub-committees of the Indian Standards Institution, etc., as in the past.

Further, the Director continued as a member of the following bodies during the year :

1. Cotton Research Advisory Sub-committee of the ICMF Cotton Development and Research Association.
2. Governing Council of Bombay Textile Research Association (BTRA).
3. Board of Management of Victoria Jubilee Technical Institute (VJTI).

In addition, the Director was also appointed as a member of the following bodies/committees during the year :

1. Indian Cotton Development Council (ICDC) as well as Sub-committee of ICDC on Research and Development, Directorate of Cotton Development, Bombay.
2. Member, General Advisory Committee for Research and Liaison as well as Sub-committee for Research and Liaison (Physics, Physical Testing and Electronics) of BTRA.
3. Expert Committee for classification of Indian cottons, constituted by the Cotton Advisory Board of the Textile Commissioner.
4. Expert Committee to consider feasibility of correlating *kapas*/cotton prices with those of yarn and cotton—constituted by the Directorate of Cotton Development, Bombay.
5. Expert Committee on cotton varieties and their spinnability, constituted by the Textile Commissioner, Bombay.
6. Team constituted by the ICAR for inspection of:
   (*i*) Premhari Research and Development Foundation, Bombay and Kharagpur, and
   (*ii*) The Maharashtra Association for the Cultivation of Science, Pune.
7. Member, ICAR Visiting Team for assessing the requirements for Grant-in-Aid for the Fifth Five Year Plan period in respect of :
   (*i*) Konkan Krishi Vidyapeeth, Dapoli,
   (*ii*) Mahatma Phule Krishi Vidyapeeth, Rahuri,
   (*iii*) Punjabrao Krishi Vidyapeeth, Akola, and
   (*iv*) Marathwada Krishi Vidyapeeth, Parbhani.
8. Chairman, Sub-committee on Technology and Engineering for preparation of syllabi for various subjects for the competitive examinations to be held by the Agricultural Scientist Recruitment Board.

Post-Graduate Training

The University of Bombay has been requested to grant recognition to this Laboratory on permanent basis for guiding students for M.Sc. and Ph.D. degree in Physics (Textiles), M.Sc. degree in Physical Chemistry, M.Text.

degree in Spinning Technology, and Ph.D. degree in Bio-physics, as the recognition granted earlier expired on the 2nd July, 1975. In addition to these, the University has been requested to extend recognition for guiding students for M.Sc. degree in Chemistry (Organic). The following Scientists of the Laboratory continued to be Research Guides for degrees mentioned against them :

1.	Dr. V. Sundaram (Director)	: M.Sc. and Ph.D. degrees in Physics (Textiles) and M.Sc. degree in Physical Chemistry.
2.	Dr. R. L. N. Iyengar (Retired Scientist)	: M.Sc. and Ph.D. degrees in Physics (Textiles)
3.	Dr. S. M. Betrabet (Senior Scientist, Microscopy)	: Ph.D. degree in Bio-physics.
4.	Dr. N. B. Patil (Senior Scientist)	: M.Sc. degree in Physics (Textiles).
5.	Dr. V. G. Munshi (Senior Scientist)	: — do —
6.	Shri M. S. Parthasarathy (Senior Scientist)	: M.Text. degree in Spinning Technology.
7.	Dr. S. N. Pandey (Scientist)	: M.Sc. Degree in Physical Chemistry.

Further, Kum. I. G. Bhatt (Jr. Scientist) has been recognised by the University of Bombay as teacher for guiding students for M.Sc. degree in Chemistry (Organic).

During the year, nine members of the staff were being guided for M.Sc. and two for Ph.D. degree in Physics (Textiles), two for M.Sc. degree in Physical Chemistry and one for Ph.D. degree in Bio-physics. One non-staff member student also registered himself for M.Text. degree in Spinning Technology during the year.

Two students have submitted their theses to the University of Bombay for award of M.Sc. degree in Physics (Textiles) during the year.

Deputation Abroad

Dr. S. M. Betrabet visited Czechoslovakia, from June 30 to July 15, 1975, as a member of the Indian Team for the implementation of programme of cooperation between India and Czechoslovakia in the field of Science and Technology—"Natural and Artificial Fibres and Fabrics". The Team has recommended three major areas of research in which the two countries may collaborate for mutual benefit. One of them concerns spinnability of Indian cottons on Open End (BD 200) Spinning Machine.

Shri K. M. Paralikar underwent training in electron microscopy in the Department of Applied Polymer Science of Tokyo University of Agriculture and Technology, from July 10 to August 17, 1975.

Expansion and Modernisation

The development and expansion programme of the Laboratory made some progress during the year under report. The work concerning installation of the new humidity and temperature plant in the Mechanical Processing Division was completed. The Plant was tested and put into commission in September, 1975. The imported controls were also received and fitted to the Plant. The work pertaining to electrical wiring and fittings for light and power in the Mechanical Processing Division was completed by the Central Public Works Department (CPWD). Further, as advised by the Bombay Electric Supply and Transport (BEST) Undertaking, it is proposed to install power factor improvement capacitors and this work has been entrusted to the CPWD.

The construction work of the second floor of the New Research Laboratory building was completed by the CPWD in all respects except one item of providing spiral staircase. The new floor was occupied by the Microscopy Division, as well as Chemistry and Statistics Sections. The space vacated by these Sections in the old building is being utilized to expand the library and ease congestion in the administrative sections.

In the past one decade, this Laboratory has undertaken various research schemes financed by the ICAR in collaboration with other Research Institutions in addition to Coordinated Cotton Improvement Project launched on All India basis. The increasingly greater responsibilities thus entrusted to this Laboratory in the interest of the national progress have necessitated further expansion and modernisation of its research sections and setting up of a few more sections, such as weaving, knitting, chemical finishing, instrumentation, etc. The Laboratory is also badly in need of a museum, a well-equipped seminar hall, a warehouse for storing facilities and a proper canteen for the staff members. In order to solve the crucial problem of additional space required for the implementation of the new development programme included in the Fifth Five Year Plan, a proposal for construction of a multi-storeyed building in the open land available in the Laboratory compound at an estimated cost of Rs. 48 lakhs was submitted to the ICAR as part of the Fifth Plan programme. This proposal has been accepted by the Council and the Government subject to the condition that the construction work should be taken up only when the existing ban on construction of buildings was lifted. As the Government of India has imposed ban on the construction of non-functional buildings only and as the proposed multi-storeyed building is a functional building for all purposes, efforts are being made through the Council

to obtain clearance from the Ministry of Finance to enable this construction work to be taken up immediately so as to implement the new development programme as early as possible.

Staff Amenities

A building consisting of 16 Type-I quarters intended for providing residential accommodation to the Class IV employees of the Laboratory was completed by the CPWD. After taking possession of the building in January, 1975, the quarters were allotted to deserving Class IV employees. The work of constructing a building consisting of eight Type IV quarters for providing residential accommodation to senior members of the staff could not be undertaken during the year due to the Government ban on construction of non-functional buildings.

Finance

A statement showing the sanctioned budget grant of the Laboratory and the actual expenditure during the financial year 1974-75 is furnished in Appendix I. It will be seen that actual expenditure is Rs. 22.31 lakhs as against the sanctioned grant of Rs. 22.30 lakhs. An expenditure of Rs. 5.36 lakhs was incurred under the Fifth Plan Scheme for modernisation and strengthening of CTRL for intensive research on cotton against the sanctioned grant of Rs. 5.50 lakhs, leaving an amount of Rs. 0.14 lakh unutilised. The savings were due to non-materialisation of purchase of certain equipment. Further, a sum of Rs. 0.44 lakh was incurred on the scheme, "Response of Indian cottons to crosslinking treatment with a view to evolve cotton varieties most suitable for chemical finishing treatment" against the sanctioned grant of Rs. 0.60 lakh. A sum of Rs. 0.09 lakh was incurred on the scheme "Studies on spinning from blends of cotton with wool, jute and ramie on cotton system" carried out in collaboration with CSWRI, Avikanagar and JTRL, Calcutta, against the sanctioned grant of Rs. 0.43 lakh. Apart from this, a sum of Rs. 0.05 lakh was incurred on the scheme "Studies on the de-burring of raw wool using mechanical devices" (carried out in collaboration with CSWRI, Avikanagar) against the sanctioned grant of Rs. 0.29 lakh. The savings in the above three schemes were due to non-filling up of certain posts, consequent on the ban imposed by the Council.

Significant Findings

At the Seventh Workshop Meeting under the All India Coordinated Cotton Improvement Project which was held on October 22 and 23, 1975, at Nagpur, the following varieties were considered as promising and their release for cultivation was recommended in the areas indicated against each :

	Variety	*Area considered to be suitable*
1.	*IAN.579-188 (GAU Cot.100 or Vishnu)	Gujarat, Madhya Pradesh and Maharashtra.
2.	*SRT.1 (GAU Cot.10)	Gujarat, Madhya Pradesh and Maharashtra.
3.	AKH.4	Vidarbha tract of Maharashtra.
4.	DHY.286	
5.	*Suvin	Tamil Nadu, Andhra Pradesh, Karnataka and Western Maharashtra

* These three varieties had been formally released by Shri Jagjivan Ram, Union Minister for Agriculture and Irrigation, on the 29th December, 1974, on the occasion of the Golden Jubilee Celebrations of CTRL.

Further, it was noted that the hybrid CBS.156 had been released for cultivation by the Tamil Nadu State Varietal Release Committee. In addition to above, the following strains were identified as promising ones :

	Strain	*State and Institution where developed*
1.	RS.235-3	Rajasthan
2.	LD.133	Punjab
3.	H.655C SH.269	Haryana : (*i*) Haryana Agricultural University, (*ii*) IARI Regional Station, Sirsa
4.	ERB.4530	Gujarat
5.	ERB.4492 JKHy.1	Madhya Pradesh
6.	JD.415	Maharashtra (MPKV, Rahuri)
7.	JK.97	Karnataka
8.	1512	Andhra Pradesh
9.	CP.15-2 CPH.2	Tamil Nadu (IARI Regional Station, Coimbatore)

It was also suggested that the popular variety Bikaneri Narma may be purified departmentally and its foundation seed made available for seed multiplication and distribution.

Studies on the response of cotton to crosslinking treatments have shown that *desi* cottons like Sanjay and Digvijay with their inherent more homogenous structure and circular cross-sectional shape are better suited for crosslinking treatment, while some cottons like Deviraj and Sujata belonging to *G. hirsutum* and *G. barbadense* groups may also prove useful in view of their high elongation.

Analysis of a few samples of cottonseed oil has shown that the cyclopropenoid fatty acid contents in crude and refined cottonseed oils range from 2 to 3 per cent, and from 0.02 to 1.25 per cent, respectively. When the keeping quality of various oils was determined, it was observed that *vanaspati* and sesame oil had the best keeping quality and safflower oil had the lowest keeping quality, while groundnut and cottonseed oils were of intermediate order.

Tests carried out on the newly fabricated laboratory model extractor have shown that the extractor removes trash to the extent of 0.8 to 2.4 per cent of the *kapas* and the output of clean *kapas* from the extractor is sufficient to feed two single roller gins or one double roller gin in continuous operation. There was no damage to the fibre quality when the *kapas* was passed through the extractor.

The results of the survey of the conditions of ginning factories in Gujarat, Maharashtra and Tamil Nadu have been analysed and certain recommendations have been made for improving the quality of ginning in these States.

Amongst the various organisms screened for amylase production, *B. subtilis* 159, was found to be the best. Conditions for increasing the amylase production are being standardised.

A patent for removal of tamarind kernel powder (TKP) and modified tamarind kernel powder (LTKP), used for sizing of cotton warps, with the help of cellulase enzyme has been filed.

Work is in progress for saccharification of agricultural cellulosic wastes using cellulase enzyme. Cellulase enzyme has also been found to be useful as an analytical tool for studying chemically modified cottons.

Studies on the strength of attachment of fibres to seeds have shown that there was no relationship between the strength of attachment of fibres and fuzziness of seeds.

A lint opener has been fabricated for cleaning small samples used for Micronaire tests.

Evaluation of neps at different stages of processing has shown that the neps in raw cotton increased due to blow-room treatment, but decreased in carding and drawing slivers. A tendency for the neps to increase further was noticed in slubber and inter stages of roving and in yarns of finer counts.

The comber waste extraction level for achieving optimum yarn strength has been found to be about 12 to 14 per cent for Giza 45 cotton, 12 per cent for Sujata and Sudan XG2VS, and 16 to 20 per cent for Hybrid 4.

A new formula for correcting yarn strength has been worked out relating the correction factor with the average count.

II. Progress of Research

During the year under review, considerable progress was made in various research investigations undertaken at this Laboratory. The installation of the conditioning plant in Mechanical Processing Division was completed during the year and regular work on the evaluation of the spinning performance of cottons samples could again be started. In addition to carrying out research on physical, chemical, structural and technological aspects, the Laboratory is the coordinating centre for the quality evaluation of all new strains under trial in different parts of the country under the All India Coordinated Cotton Improvement Project. A brief idea of the progress made under the various projects is given below :

Evaluation of the Quality of Cotton Samples Received from Agricultural Trials

The Laboratory receives a large number of samples for various tests from trials conducted by the Agricultural Universities, the State Departments of Agriculture, etc. Some samples are obtained in connection with various research investigations at the Laboratory. The number of samples received during the years 1973, 1974 and 1975 together with corresponding average figures for the quinquennium 1966-70 are given in Table 1(*a*), while Table 1 (*b*) contains the number of samples tested at various regional stations during 1975.

The samples received from the agricultural trials are tested in order of their receipt and the test results are sent to the officers concerned as quickly as possible. The results of tests on each of the Trade Variety and Standard Indian Cotton samples are reported in the form of a Technological Circular immediately after tests are completed. Later, the test results are consolidated for the whole season and published as two Technological Reports, one on the Trade Varieties and the other on Standard Indian Cottons. The technological research samples are utilized for the Laboratory's research work; no test reports are usually issued on such samples as the results are included in the relevant research papers published by the Laboratory. Besides these, some samples are received for miscellaneous tests, such as determination of quality of ginning, neppiness, oil content in cottonseed, etc.

The number of samples which were tested for fibre characteristics and spinning performance is given in Table 2. These samples have been grouped under two categories, viz.: (A) All India Coordinated Cotton Improvement Project and (B) Other State Schemes.

TABLE 1(*a*): NUMBER OF COTTON SAMPLES RECEIVED FROM THE STATE DEPARTMENTS OF AGRICULTURE FOR TESTS AT THE LABORATORY

Types of test	Average for the quinquennium 1966-70	1973	1974*	1975*
Fibre and full spinning	597	418	309	233
Fibre and microspinning	2,250	2,080	1,796	2,357
Microspinning alone		816	46	—
Fibre test alone	143	80	58	39
Mill tests	14	8	14	—
Standard Cottons	23	22	24	24
Trade Varieties—lint	27	37	9	41
Trade Varieties—*kapas*	42	49	47	38
Technological Research	272	63	107	48
Miscellaneous	100	—	—	1
Total	3,468	3,573	2,410	2,781

* A large number of samples could not be accepted for tests due to renovation work in the Mechanical Processing Division.

TABLE 1(*b*): NUMBER OF SAMPLES TESTED AT THE REGIONAL STATIONS

Station	Total number of samples tested			
	Mean fibre length	Fibre fineness	Fibre strength	Fibre maturity
Coimbatore	937	920	937	920
Dharwar	2,319	1,446	1,419	1,446
Hissar	311	311	311	311
Indore	675	675	674	675
Ludhiana	343	297	343	361
Nanded	1,039	1,039	1,039	1,039
Nandyal	456	441	585	500
Sriganganagar	595	339	436	339
Surat	8,793*	5,302	4,106	4,141**

* 8,751 samples were tested on Digital Fibrograph and 42 samples on Balls Sorter.
** 4,106 samples were tested by the Micronaire Spacer Technique and 35 samples by the Caustic Soda Method.

TABLE 2: NUMBER OF SAMPLES TESTED IN 1975

(A) All India Coordinated Cotton Improvement Project

State	Fibre and full spinning	Fibre and micro-spinning	Micro-spinning	Fibre tests	Total
Punjab	—	173	—	36	209
Haryana	—	123	—	—	123
Uttar Pradesh	—	28	—	—	28
Rajasthan	—	56	—	—	56
Madhya Pradesh	13	326	—	—	339
Gujarat	48	266	—	—	314
Maharashtra	7	235	—	21	263
Andhra Pradesh	2	58	—	27	87
Karnataka	8	330	—	—	338
Tamil Nadu	6	51	3	—	60
Others	—	73	—	24	97
Total	84	1,719	3	108	1,914

(B) Other State Schemes

	Fibre and full spinning	Fibre and Micro-spinning	Fibre tests	Total
Punjab	1	—	—	1
Uttar Pradesh	3	—	—	3
Madhya Pradesh	7	—	—	7
Gujarat	19	4	35	58
Maharashtra	7	—	37	44
Andhra Pradesh	10	—	3	13
Karnataka	18	—	8	26
Tamil Nadu	6	—	—	6
Others	—	120	—	120
Total	71	124	83	278

ALL INDIA COORDINATED COTTON IMPROVEMENT PROJECT

This is the eighth year of the Project. Reports on the samples grown under various trials, such as Coordinated Varietal Trial, Preliminary Varietal Trial, Pilot Project Trial, etc., for the North, Central and South Zones were presented at the All India Workshop meeting held at Nagpur during October, 1975.

The Project covered eight locations in the North Zone comprising of the Punjab, Haryana and Rajasthan States, and IARI, New Delhi, seventeen locations in the Central Zone comprising of the states of Madhya Pradesh, Gujarat and Maharashtra, and seven locations in the South Zone comprising of the states of Andhra Pradesh, Karnataka and Tamil Nadu.

NORTH ZONE

G. hirsutum Trials

The Coordinated Varietal Trial was conducted for: (*i*) Normal Plant Type at Ajmer, Faridkot, Jullundur, Ludhiana, Sirsa and Sriganganagar, (*ii*) Short Branch Type at Faridkot, Ludhiana and Sirsa, and (*iii*) Short Duration Type at Faridkot, Jullundur, Ludhiana and Sirsa.

Table 3 gives the data on the ranges of mean fibre length, fineness, maturity and bundle strength values of the samples pertaining to all the three types.

It may be seen from Table 3 that the mean fibre length for the Normal Plant Type samples ranged between 20.6 mm and 27.9 mm. The range of mean fibre length for the Short Branch Type samples was between 21.1 mm and 27.4 mm, while that for Short Duration Type was between 20.3 mm and 27.7 mm. The ranges of fineness (Micronaire value) for the Normal Plant Type, Short Branch Type and Short Duration Type were from 2.9 to 4.8, 3.2 to 4.6 and 3.2 to 5.0, respectively.

It may also be seen from Table 3 that the maturity values were low for a few samples pertaining to Normal Plant Type at Ajmer and Sriganganagar. In general, fibre maturity was good in the case of samples from Sirsa. The maturity was low in the case of a few samples of Short Branch Type trials raised at Faridkot and Ludhiana, as well as of a few samples raised under the Short Duration Type trials at Faridkot, Jullundur and Ludhiana.

The range of bundle strength for the samples pertaining to Normal Plant Type was between 43.4 g/t and 53.1 g/t, and from 42.9 g/t to 52.0 g/t, for Short Branch Type, while for Short Duration Type samples it was between 40.7 g/t and 54.7 g/t.

TABLE 3 : SUMMARY OF FIBRE TEST RESULTS ON STRAINS TESTED IN COORDINATED VARIETAL TRIAL OF *G. hirsutum* Br.04: NORTH ZONE

Location	Normal Plant Type					Short Branch Type					Short Duration Type				
	No. of samples	Mean fibre length (mm)	Fineness (Micronaire value)	Maturity	Bundle strength (g/t)	No. of samples	Mean fibre length (mm)	Fineness (Micronaire value)	Maturity	Bundle strength (g/t)	No. of samples	Mean fibre length (mm)	Fineness (Micronaire value)	Maturity	Bundle strength (g/t)
Ajmer ..	18	20·6 to 26·9 (23·8)	3·3 to 4·8 (3·9)	Low to average	46·1 to 53·1 (50·0)	—	—	—	—	—	—	—	—	—	
Faridkot ..	5	21·6 to 26·9 (24·6)	3·8 to 4·4 (4·0)	Average	47·2 to 52·0 (50·7)	7	22·1 to 25·1 (23·8)	3·7 to 4·6 (4·1)	Low to average	44·5 to 52·0 (48·2)	6	22·1 to 26·2 (23·4)	3·9 to 4·5 (4·2)	Low to average	45·6 to 54·7 (49·7)
Jullundur ..	15	21·3 to 27·9 (25·2)	3·7 to 4·7 (4·1)	Average	46·6 to 52·0 (48·9)	—	—	—	—	—	18	20·8 to 26·9 (24·2)	3·2 to 5·0 (3·9)	Low to average	46·6 to 53·6 (49·4)
Ludhiana ..	15	21·1 to 27·2 (25·0)	3·4 to 4·3 (3·7)	Average	43·4 to 49·8 (47·7)	11	21·3 to 27·4 (24·3)	3·6 to 4·6 (4·0)	Low to average	42·9 to 48·8 (46·7)	17	21·3 to 27·7 (24·7)	3·3 to 4·6 (3·9)	Low to average	40·7 to 49·3 (45·4) †
IARI, Sirsa ..	7	23·1 to 26·9 (24·4)	3·4 to 4·1 (3·6)	Good	45·0 to 52·0 (49·6)	7	21·1 to 25·7 (23·6)	3·2 to 3·9 (3·6)	Average	45·0 to 50·9 (48·9)	6	20·3 to 25·7 (22·4)	3·2 to 4·2 (3·6)	Average to good	46·1 to 51·5 (49·7) †
Sriganganagar	18	20·8 to 27·7 (24·7)	2·9 to 4·6 (3·4)	Low to average	45·6 to 48·8 (47·1)		—	—	—	—		—	—	—	—

Note : Figures in bracket indicate averages.
Maturity coefficient Low— below 0·70
Average— 0·70 to 0·80
Good— above 0·80
Bundle strength value are at nominal zero gauge.

The following strains grown at the locations indicated recorded encouraging spinning performance at 40s count.

Location	*Strains*
Ajmer	RS.283
Jullundur	J.205, SH.369, H.642 and SH.169-1-70.
Ludhiana	H.537 and SS.167
Sirsa	H.654C, SS.167 and H.642C

Samples pertaining to Preliminary Varietal Trial were received from Faridkot, Jullundur and Ludhiana, grown under irrigated conditions, for microspinning tests. Mean fibre length for the 10 samples raised at Faridkot ranged between 21.1 mm and 23.9 mm, while maturity and bundle strength values were satisfactory. The range of mean fibre length for the 36 samples raised at Jullundur was between 21.1 mm and 27.9mm. They had average maturity and good bundle strength. In the case of 33 samples received from Ludhiana, mean fibre length ranged between 22.6 mm and 28.7 mm. They recorded low to average maturity and good bundle strength values.

The strains SA.344 and SH.169 raised at Jullundur and H.615 and SA.344 raised at Ludhiana recorded satisfactory spinning performance at 40s count.

G. arboreum Trials

In the Coordinated Varietal Trial of *G. arboreum*, two sets, each containing fourteen *G. arboreum* and four *G. hirsutum* strains were received from Jullundur. The samples belonging to the first set had been raised under sprayed conditions and those belonging to the second set under unsprayed conditions. Mean fibre length for the *arboreum* samples raised under sprayed conditions ranged from 16.5 mm to 19.8 mm, while the same under unsprayed conditions ranged from 15.2 mm to 19.0 mm. Bundle strength values for the samples from both the sets were satisfactory. There was no appreciable difference in the fibre properties of the samples from both the sets. Among the four *hirsutum* strains taken as control, the strain J.205 showed better combination of all the fibre properties.

Miscellaneous Trial

From the Miscellaneous Trial conducted at IARI, New Delhi, 18 samples were received. Mean fibre length for these samples ranged between 23.6 mm and 27.7 mm. Maturity and bundle strength values were average to good. In addition to H.14, the strains 5-167-169, 3-178, 5-108, 5-134-135 and 4-107-109 recorded satisfactory spinning performance at 40s count.

CENTRAL ZONE

G. hirsutum Trials

In the Coordinated Varietal Trial, samples were received from Rahuri and Surat under irrigated conditions, and from Badnawar and Khandwa under rainfed conditions. Samples specially identified for high ginning outturn were also received from Badnawar, Rahuri and Surat.

Table 4 gives a summary of the test results of the trials in the Central Zone. It is seen from this table that mean fibre length for the strains raised under irrigated conditions ranged from 21.3 mm to 30.5 mm. Micronaire values ranged from 3.0 to 4.8. Maturity was low to average and the bundle strength values ranged from 40.7 g/t to 47.2 g/t. As regards the samples raised under rainfed conditions, mean fibre length ranged from 22.4 mm to 29.0 mm, while Micronaire values were from 2.6 to 4.6. Maturity was low in the case of many samples from Badnawar. Bundle strength values ranged from 39.7 g/t to 49.3 g/t. The ranges of mean fibre length, Micronaire value and bundle strength for the samples raised under high ginning type trial were from 21.1 mm to 29.6 mm, 2.8 to 5.2 and 39.1 g/t to 46.1 g/t, respectively. Maturity was low in the case of a few samples raised at Badnawar. Also, most of the samples raised at Rahuri were found to be immature. The following strains recorded promising spinning performance :

Location	*Count*	*Strains*
Surat	50s	IAN.4757, IAN.6074, J.1616, 70IH.452, CP.25-1, MCU.5, IAN.579-188, IAN.187-1, ACH.105, 69BH.27-26, 69BH.29-71-1, 70IH-315-2 and 69BH.30-9
Rahuri	50s	D.40 and SH.169-1-70
Badnawar	50s	B.68-2647, 70IH.452, 66BH.5-91, MCU.5, Badnawar 1 and IAN.579-188.

It may be noted that the samples from Khandwa could not be spun due to excessive lapping of fibres beyond carding stage. The causes of lapping are suspected to be: (*i*) broken seed bits during ginning which get further crushed during the spinning process at the rollers and (*ii*) presence of honeydew. Honeydew is a sticky substance resulting from secretion of aphids. Tests carried out showed light to moderate amounts of sugar present on the fibre indicating presence of honeydew. Similar difficulties have been experienced at carding stage for processing of samples pertaining to Coordinated Varietal Trial conducted at Rahuri. These samples were very immature.

TABLE 4: SUMMARY OF FIBRE TEST RESULTS ON STRAINS TESTED IN COORDINATED VARIETAL TRIAL OF *G. hirsutum* Br.04: CENTRAL ZONE

Location	Normal Plant Type					Short Branch Type					Short Duration Type				
	No. of samples	Mean fibre length (mm)	Fineness (Micronaire value)	Maturity	Bundle strength (g/t)	No. of samples	Mean fibre length (mm)	Fineness (Micronaire value)	Maturity	Bundle strength (g/t)	No. of samples	Mean fibre length (mm)	Fineness (Micronaire value)	Maturity	Bundle strength (g/t)
Badnawar ..	—	—	—	—	—	16	22·4 to 27·9 (25·3)	2·6 to 3·6 (3·2)	Low to average	39·7 to 44·5 (42·4)	12	22·6 to 26·9 (25·1)	3·0 to 4·4 (3·6)	Low to average	39·7 to 46·1 (42·8)
Khandwa ..	—	—	—	—	—	16	23.4 to 29.9 (25.5)	3.1 to 4.6 (4.0)	Average to good	43.4 to 49.3 (46.9)		—	—	—	—
Rahuri ..	4	21·3 to 24·4 (23·0)	3·0 to 3·5 (3·2)	Low to average	41·3 to 44·0 (42·9)	—	—	—	—	—	5	21·1 to 24·6 (23·2)	2·8 to 4·2 (3·5)	Low to average	39·1 to 46·1 (42·0)
Surat ..	12	27·2 to 30·5 (28·4)	3·1 to 4·8 (3·9) †	Low to average	40·7 to 47·2 (43·0)	—	—	—	—	—	10	25·7 to 29·6 (27·7)	3·8 to 5·2 (4·6)	Average	40·2 to 46·1 (43·3)

Note : Figures in bracket indicate averages.
Maturity coefficient: Low— below 0·70
Average— 0·70 to 0·80
Good— above 0·80
Bundle strength at nominal zero gauge.

Coordinated Varietal Trials with entries approved for North Zone trials were also conducted at Nanded and Rahuri under irrigated conditions. The test results are summarised below :

	Nanded	*Rahuri*
Normal Plant Type, Br.04(*a*)		
No. of samples	—	16 samples
Mean fibre length (mm)	—	21·6 mm to 27·9 mm
Fineness (Micronaire value)	—	3·3 to 4·3
Maturity	—	Average to good
Bundle strength (g/t)	—	37·0 to 44·5
Short Branch Type, Br.04(*b*)		
No. of samples	12 samples	12 samples
Mean fibre length (mm)	22·6 to 27·2	20·6 to 30·5
Fineness (Micronaire value)	3·3 to 4·6	3·2 to 4·3
Maturity	Low to average	Low to average
Bundle strength (g/t)	33·8 to 40·2	33·2 to 43·4
Short Duration Type, Br.04(*c*)		
No. of samples	20 samples	18 samples
Mean fibre length (mm)	21·1 to 29·0	20·8 to 26·4
Fineness (Micronaire value)	3·0 to 4·4	3·3 to 4·2
Maturity	Low	Low to average
Bundle strength (g/t)	34·3 to 40·7	37·5 to 44·5

Samples pertaining to Preliminary Varietal Trials were received from Amreli, Badnawar, Khandwa, Rahuri and Surat under Normal Plant Type. Another set of six samples raised under New Plant Type was received from Khandwa.

Test results of 22 samples received from Badnawar indicated that their mean fibre length ranged from 22.4 mm to 27.9 mm. Maturity was low for a number of samples. Bundle strength values were average to good. None of the samples recorded satisfactory spinning performance at 50s count.

Mean fibre length for the 26 samples received from Khandwa under the Normal Plant Type Trial indicated that their mean fibre length ranged from 23.4 mm to 28.2 mm. Except for a few samples, maturity was satisfactory. Bundle strength values were average to good.

Another set of 12 samples under the New Plant Type Trial were received from Khandwa. Mean fibre length for these samples ranged from 22.1 mm to 27.4 mm. Maturity was satisfactory and the bundle strength values were good. The samples from Khandwa could not be spun due to reasons already mentioned.

A set of five samples pertaining to the Preliminary Varietal Trial (Normal Plant Type) was received from Rahuri. All the samples recorded mean fibre length less than 25.4 mm. (1.00") with low maturity and average bundle strength. None of the samples fared well at 50s count.

Eleven out of twelve samples raised under the above trial at Surat indicated promising potential for staple length as all of them recorded mean fibre length over 27.0 mm. Maturity was also satisfactory for most of the strains. Bundle strength values were average to good. There appears to be much scope to select material for further trial since as many as eight samples recorded encouraging performance at 50s count.

Samples pertaining to Initial Evaluation Trial were received from Badnawar, Junagadh and Khandwa. The strains B.73-2900 and Badnawar 1 from Badnawar and S.1006 and J.1604 from Junagadh recorded satisfactory spinning performance at 50s count.

G. barbadense Trials

In the *G. barbadense* Trials, samples grown under irrigated conditions were received from Junagadh and Khandwa.

In the case of samples raised at Junagadh, none of the three samples recorded superior technological performance over the control variety Giza. Mean fibre length for the seven *barbadense* strains from Khandwa ranged from 27.2 mm to 33.5 mm. They had satisfactory maturity and good bundle strength. However, only the strain Suvin 62-17 fared well at 80s count (micro).

G. arboreum Trials

Samples pertaining to Coordinated Varietal Trial of *G. arboreum* strains were received from Amreli and Parbhani. A set of 14 samples approved for the trials in North Zone was also received from Nanded. In addition to the local *hirsutum* strain, namely L.147, two other *hirsutum* controls, Khandwa 2 and SRT.1, were also taken in order to compare earliness, ginning outturn, yield and quality. As far as quality is concerned, *hirsutums* have recorded better fibre characters than the *arboreums*.

G. herbaceum Trials

Samples pertaining to Coordinated Varietal Trial were received from Broach, Surat and Viramgam.

Mean fibre length for the 18 *herbaceum* entries raised at Broach ranged between 19.3 mm and 21.6 mm, while uniformity in staple was excellent. They had satisfactory maturity and bundle strength. None of the strains fared well at 30s count.

A set of nine *herbaceums* and three *hirsutums* was raised at Surat under this trial. The test results indicated that the range of mean fibre length for *herbaceums* was between 21.6 mm and 25.1 mm. They had satisfactory maturity and bundle strength. All the strains recorded satisfactory yarn strength at 40s count.

Tests on the 12 *herbaceum* strains raised under this trial at Viramgam indicated that their mean fibre length ranged from 19.6 mm to 21.8 mm. The strains appeared to be rather coarse as they had recorded Micronaire value ranging between 5.0 and 6.0. The bundle strength values were good. None of the strains fared well at 30s count.

Miscellaneous Trials

A large number of trials with different objectives were conducted at various locations in Madhya Pradesh, Gujarat and Maharashtra. The following strains were found promising.

Location	*Trial*	*Promising strains*
Madhya Pradesh		
Badnawar	Pilot Project Demonstration	70IH.452, 66BH.5-91 KW.68-2970 and Badnawar 1
Indore	Pilot Project Demonstration	66BH.5-91 and 70IH.45
Indore	Pilot Hybrid Trial	JK.Hy.2 and Varalaxmi
Gujarat		
Junagadh	Hybrid Trial	G.67 × USSR 76. G.67 × SB.289E, ERB.4530 × G.67, Varalaxmi and Hybrid 4
Surat	First Generation of Inter-*hirsutum* hybrids	Guj. 67 × Acala 44, Guj. 67 × Nect (Patho), Guj. 67 × P.30, Guj. 67 × Stoneville, Guj. 67 × SRT.1, IAN.579-188 × B.15-1684, IAN.579-188 × SRT.1, Varalaxmi, Hybrid 4 and IAN.579-188
Maharashtra		
Amravati	Hybrid Trial	Hybrid No. 1, Hybrid 4, CHP.4, Hybrid No.3 and Hybrid No.5
Rahuri	Hybrid Trial	Laxmi × Thanekar, Bonde × SB.289E, G.67 × Suvin, Coker × Suvin, Buri 1007 × Suvin, G.67 × SB.289E, Nectariless × SB.289E, Coker × Thanekar, G.67 × Thanekar, RHR. 201, RHR.202, Laxmi × Sujata, B.147 × Sujata, Varalaxmi, Vishnu × MCU.5, Gregg (Self) × MCU.5, SS.167 × Vishnu, Vishnu × SS.167 and CBS.156

SOUTH ZONE

G. hirsutum Trials

Coordinated Varietal Trial was conducted under irrigated conditions at Arabhavi and Srivilliputtur and under rainfed conditions at Shimoga.

Mean fibre length for the eight full spinning samples raised at Arabhavi ranged from 24.6 mm to 27.9 mm. Maturity was low for the strains DS.70-480, AS.38 and JK.97. Bundle strength values were average. The strains DS.70-480, C.P.15-2, AS.38, ELS.191, MCU.5 and Mysore Vijaya recorded satisfactory CSP values at 50s count.

Sixteen samples grown under irrigated conditions were received from Srivilliputtur for microspinning tests. Mean fibre length for these samples ranged from 26.7 mm to 31.5 mm. Maturity was satisfactory except for the strain AV.1661. Bundle strength values were average to good. All the strains recorded satisfactory CSP values at 50s count. The best spinning performance was recorded by the strain MCU.5 followed by CP.25-1, MCU.4, IS.MCU.5-2 and EL.031.

Mean fibre length for the 14 samples raised under rainfed conditions at Shimoga ranged between 24.6 mm and 30.5 mm. Maturity was low for a number of samples and the bundle strength values were average. The strains CO.157 and 66BH.25-10 recorded encouraging CSP values at 50s count.

Samples pertaining to the Preliminary Varietal Trial were received from Srivilliputtur (under irrigated conditions) and from Shimoga (under rainfed conditions). Mean fibre length for the 18 samples from Srivilliputtur ranged from 26.4 mm to 32.5 mm. Maturity was satisfactory and the bundle strength values were average to good. As many as 12 strains recorded satisfactory spinning performance at 50s count (micro). The first five strains were: NA.210, 46-1, GS.23-1009, MCU.5 and ELS.177.

Range of mean fibre length for the 20 samples received from Shimoga was between 24.9 mm and 30.2 mm. Maturity was low for a number of samples and the bundle strength values were average. Only two strains, namely CPD.29 and NA.215, recorded satisfactory spinning performance at 50s count (micro).

Samples pertaining to the Initial Evaluation Trial were received from Arabhavi and Dharwar.

Test results of 30 samples raised at Arabhavi indicated that their mean fibre length ranged from 23.1 mm to 27.7 mm. Maturity, in general, was low and the bundle strength values were average. The strains Mysore Vijaya, CPC.34-25, MCU.5 and AHO.75-231 recorded satisfactory spinning performance at 40s count.

Two sets of 30 samples each were received from Dharwar under Initial Evaluation Trial. Mean fibre length for these samples ranged from 22.1 mm to 27.2 mm. Maturity was low for most of the samples. Bundle strength

values were average to good. The strains CPD.17-1, CPD.5-2, CPD.34-34, CPD.34-22, CPD.27-31, CPD.34-23, JK.97-11, JK.78-300, UAS.34-638, UAS.110-185, UAS.70-480-16, UAS.99-2-2, UAS.595-740, DS.28-120, CPD.6-B-1, CPD.17B-12, CPD.11-3-8, JK.78-301, JK.78-9, CPD.35-31, CPD.1-2, CPD.27-30, Laxmi and Mysore Vijaya recorded satisfactory spinning performance at 40s count.

G. barbadense Trial

A set of eight samples under the Coordinated Varietal Trial was received from Shimoga. Mean fibre length for these samples ranged from 27.7 mm to 34.3 mm. Maturity was low for the strain Andrews. The strains Suvin 62-17, Sujata, IBSI.53, CBS.34, CBS.148 and Andrews recorded satisfactory spinning performance at 80s count.

Miscellaneous Trials

Many miscellaneous trials were conducted at various locations and the following strains were found promising :

Location	*Trial*	*Promising strains*
Andhra Pradesh		
Nandyal	Hybrid Trial	NHy.12 and Varalaxmi (100s count)
Karnataka		
Arabhavi	*Ad hoc* Trial	Suvin 62-17, Sujata, IBSI.53 and Giza 7 (50s count)
Dharwar	Final Evaluation Trial	JK.79-2-69, JK.44-47, AHO.75-229, CPD.32B-17, AHO.61-66-1, AHO.80-212-2, and MCU.5(40s count)
Dharwar	Pilot Project Demonstration	JK.97-74, JK.97-82, JK.97-11, JK.97-188, JK.97-137, JK.97-311, JK.97-147, JK.97-315, JK.79-243, JK.79-418, JK.79-424, JK.79-610, JK.79-621, JK.79-488, JK. 79-326, JK.79-86 and Laxmi (30s count)
Shimoga	Miscellaneous Trial	MS.19 (50s count)
Tamil Nadu		
IARI, Coimbatore	Development of Long and Medium Staple Varieties	CP.1998F (50s count)

The Seventh Workshop Meeting of the AICCIP

The Seventh Workshop Meeting of the All India Coordinated Cotton Improvement Project was held on October 22 and 23, 1975, at Nagpur. The Technological Report on the samples pertaining to various trials received from North, Central and South Zones during the year 1975 was presented.

The following varieties were recognised as promising and recommended to the Central Varieties Release Committee for release:

Variety	*Proposed by*	*Area considered suitable*
IAN.579-188* (also known as GAU Cot. 100 and Vishnu)	Cotton Specialist, Gujarat	Gujarat, Madhya Pradesh and Maharashtra
SRT.1* (GAU Cot.10)	— do —	Gujarat, Madhya Pradesh and Maharashtra
AKH.4 DHY.286	Punjabrao Krishi Vidyapeeth, Akola	Vidarbha area of Maharashtra (AKH4. is recommended mainly for its better fibre quality compared to AK.235)
Suvin*	Project Coordinator (Cotton)	Tamil Nadu, Andhra Pradesh, Karnataka and Western Maharashtra (A high quality cotton in great demand by the industry and farmers)

* Released by Hon. Union Minister for Agriculture during the Golden Jubilee cclebrations of this Laboratory in December 1974.

The workshop recorded that hybrid CBS.156 had been released in Tamil Nadu by the State Varieties Release Committee.

In the case of JK.97, it was recommended that this variety may now be considered by the University of Agricultural Sciences for pre-release multiplication in Karnataka.

It was further suggested that Bikaneri Narma may be recognised as a variety and that it may be purified and foundation seed made available for seed multiplication and distribution.

It was also considered that while work on development of long staple cotton should be continued, greater stress should be placed on the development of medium and short staple cottons in order to meet the short-fall in production in these categories. The workshop recommended that certain varieties with valuable characteristics, which are going out of cultivation, must be conserved and germ-plasm maintained properly.

The following other varieties were considered for pre-release multiplication:

Sponsoring Agency	*Variety*
Punjab	LD.133
Rajasthan	RS.235-3
Haryana	H.555C
IARI, Sirsa	SH.269
Gujarat	ERB.4530
Madhya Pradesh	ERB.4492, and JK.Hy.1
MPKV, Rahuri (Maharashtra)	SD.415
Andhra Pradesh	1512
IARI, Coimbatore	CP.15-2 and CPH.2

Promising New Varieties

1. AKH.4

This is an *arboreum* variety evolved at Akola by the Punjabrao Krishi Vidyapeeth and was derived from the varieties: (*i*) Melvanisis, (*ii*) Cernuum, (*iii*) Bani, and (*iv*) Jadi. It has been recommended for release in the assured rainfall area of Vidarbha region of Maharashtra to replace the existing variety, AK.235. The duration of this variety is about 180-200 days. It has recorded mean fibre length ranging between 21.0 mm and 23.5 mm with Micronaire value between 4.7 and 5.4. It can be spun into 30s count.

2. DHY.286

The pedigree of this strain is (0394 × 6-6) × (0394 × CTI.8). This variety is recommended for cultivation in all districts of Vidarbha to replace B.1007 since it has been found suitable for the assured rainfall areas of Vidarbha region, giving about 14-15 % higher yield than the existing variety, B.1007. The total duration is about 175-190 days. This strain has recorded considerable variation in the fibre characters. Mean fibre length ranged between 23 mm and 27 mm with Micronaire value ranging between 2.8 and 4.9. The bundle strength values were around 46 g/t. It has shown spinning potential as high as 50s. It has been consistantly showing superior performance over B.1007.

3. H.655C

This strain was tried in the advanced trials in the North Zone and has recorded higher yields than the control varieties, H.14 and J.205. It was found to be much superior to H.14 in respect of fibre quality. The ginning percentage of this variety is on par with that of H.14.

4. LD.133

This strain has been tried in the advanced trials of *arboreum* at eight locations in North Zone. It has recorded higher yield of 18 qtl/ha against 15 qtl/ha of G.27 and 14 qtl/ha of Bikaneri Narma. It has also shown higher ginning outturn than G.27 and Bikareri Narma. As far as technological characters are concerned, this variety is on par with G.27 but inferior to Bikaneri Narma.

5. ERB.4530

This *barbadense* strain was evolved from the cross of Marrad and USSR.76 at Surat. It is claimed that it has better ginning outturn, higher yield potential and, therefore, gives higher lint production than Giza 7. The strain was recommended for pre-release seed multiplication. It has recorded mean fibre length of over 29 mm with Micronaire value around 3.5 and bundle strength value of about 45 g/t. It may be suitable for finer counts of 50s and above.

6. JKHy.1

This new hybrid developed at the Agricultural College, Indore, is reported to have recorded much higher yields than the established hybrids, such as Hybrid 4. It is also claimed that the duration of this hybrid is about 180 days which is much less compared to the other hybrids. As this hybrid has not been thoroughly examined for the technological properties at this laboratory, it is proposed to test more samples during the next season.

7. JD.415

This is an *arboreum* strain which has recorded much higher yield over the control, Jyoti, at Jalgaon, Dhulia, Chopda and Rahuri. It has also recorded higher ginning outturn.

8. 1512

This is an *arboreum* variety which is reported to have recorded significantly higher yield than the existing *arboreum* variety, Nandicum, at Nandyal.

9. JK.97

This variety has been evolved from recurrent selection programme. The parents involved are CL.20 of Sudan and Acala 5675 of USA. It is an early type variety for which first picking will commence in about 100-120 days and final picking will be over in 130-140 days. Mean fibre length for this strain ranged between 23 mm and 25 mm with bundle strength over 43 g/t. The spinning potential of this variety is adjudged around 40s.

10. CP.15-2

It is a selection from the cross of (A.218 × MCU.5) × Reba B.50 identified at the IARI Regional Station, Coimbatore. The performance of CP.15-2, has been very impressive during the past 3 to 4 years, both under irrigated and rainfed conditions, with about 40% ginning outturn and spinning capacity of about 50s count. CP.15-2 has an yield potential of 30 to 34 qtl/ha as an irrigated crop. It has recorded a maximum yield of 23 qtl/ha under rainfed conditions with an average of 12 qtl/ha. It has recorded mean fibre length around 27 mm with Micronaire value between 3.7 and 4.0, and fibre bundle strength around 43 g/t.

11. CPH.2

With the introduction of genetic male sterile line 'Gregg' from the USA, it has been possible to develop hybrid cotton with greater ease and at much cheaper cost. As a result of intensive screening of several hybrid combinations taken up at the IARI Regional Station, Coimbatore, utilizing this male sterile line, a new hybrid, namely CPH.2, possessing high yield, short duration (140-150 days) and with a capacity to spin 30s count has been identified. CHP.2 has the parentage of Gregg (male sterile), an upland type of cotton as the pistil parent and the Russian photo-insensitive upland type K.3400 as pollen parent. It has recorded mean fibre length of about 23 mm with Micronaire value around 3.5 and bundle strength value over 40 g/t.

EXTRA-LONG STAPLE (27 MM AND ABOVE) COTTONS

The results of the detailed tests carried out on extra-long staple cotton samples received and tested at the Laboratory during 1975 are shown in Table 5. This supplements the prominent strains described under the All India Coordinated Cotton Improvement Project.

MILL TESTS

Selected improved varieties of cotton, which possess promising characteristics and are considered superior to the current ones on the basis of the Laboratory tests, are subject to actual mill tests for their performance at the mills. Only after the superiority of the new varieties is confirmed by the mill tests, at least for two seasons, the varieties are recommended for large scale propagation. Necessary arrangements for carrying out mill tests are made by this Laboratory. A few mills have been cooperative enough to undertake such tests on the samples sent to them.

During the year, mill tests were carried out on 12 samples pertaining to the 1973-74 season. The comparative test results at the mill and the Laboratory are given in Table 6.

TABLE 5 : RESULTS OF EXTRA-LONG STAPLE (27 MM AND ABOVE) COTTONS TESTED IN 1975

Variety	Place	Mean fibre length		Fineness		Maturity co-efficient	Bundle strength	
		mm	in	Millitex	Micronaire value		Tenacity (zero gauge g/t)	PSI (zero gauge lb/mg)
Andhra Pradesh								
MCU.5	Amravati	27·7	1·09	134	3·4	0·67	42·3	7·9
NHY.12	Nandyal	36·1	1·42	102	2·6	0·66	48·8	9·1
Varalaxmi ..	,,	32·8	1·29	134	3·4	0·75	47·7	8·9
Giza 7	Yemmiganur	29·0	1·14	150	3·8	0·69	45·0	8·4
SI Adrews ..	,,	30·2	1·19	142	3·6	0·68	42·3	7·9
Gujarat								
Gujarat 67 ..	Anjar	28·5	1·12	122	3·1	0·65	41·8	7·8
Gujarat 67 ..	Idar	29·3	1·15	126	3·2	0·67	41·8	7·8
Gujarat 67 ..	Mandvi	30·4	1·20	126	3·2	0·67	42·3	7·9
Hybrid 4	Navsari	28·1	1·11	157	4·0	0·73	39·7	7·4
ACH.105	Surat	27·0	1·06	173	4·4	0·83	46·1	8·6
CP.25-1	,,	29·2	1·15	142	3·6	0·79	42·9	8·0
Gujarat 67 × Acala 44 ..	,,	30·2	1·19	150	3·8	0·71	43·4	8·1
Gujarat 67 × Nect (Patho)	,,	28·7	1·13	157	4·0	0·71	41·8	7·8
Gujarat 67 × P.30	,,	27·7	1·09	173	4·4	0·74	44·5	8·3
Gujarat 67 × Stoneville ..	,,	29·0	1·14	161	4·1	0·73	42·9	8·0
Gujarat 67 × SRT.1	,,	28·4	1·12	173	4·4	0·72	46·1	8·6
Hybrid 4	,,	27·0	1·06	181	4·6	0·74	42·9	8·0
IAN.11-1	,,	27·9	1·10	177	4·5	0·76	43·4	8·1
IAN.187-1 ..	,,	27·7	1·09	154	3·9	0·83	40·7	7·6
IAN.579-188 ..	,,	29·2	1 15	150	3·8	0·79	42·3	7.9
IAN.579-188 × B.15-1684 ..	,,	29·0	1·14	165	4·2	0·70	56·4	9·4
IAN.4705 ..	,,	27·4	1 08	189	4·8	0·88	42·9	8·0
IAN.4757 ..	,,	28·2	1·11	157	4·0	0·75	44·0	8·2
IAN.5131 ..	,,	27·4	1·08	161	4·1	0·86	41·3	7·7
IAN.6014 ..	,,	27·2	1·07	134	3·4	0·78	41·3	7·7
IAN.6074 ..	,,	29·2	1·15	122	3·1	0·68	40·7	7·6
J.1616	,,	28·4	1·12	157	4·0	0·80	44·0	8·2
MCU.5	,,	30·5	1·20	134	3·4	0·79	47·2	8·8
ND.9	,,	27·9	1·10	189	4·8	0·84	45·0	8·4

TABLE 5 : *Contd.*

Variety	Place	Mean fibre length		Fineness		Maturity co-efficient	Bundle strength	
		mm	in	Millitex	Micronaire value		Tenacity (zero gauge g/t)	PSI (zero gauge lb/mg)
Varalaxmi ..	Surat	33·8	1·33	134	3·4	0·68	47·2	8·8
69BH.27-26 ..	,,	29·6	1·16	197	5·0	0·86	45·6	8·5
69BH.29/61-1 ..	,,	28·2	1·11	161	4·1	8·87	43·4	8·1
69BH.30-9 ..	,,	27·9	1·10	193	4·9	0·79	41·8	7·8
70IH.452	,,	29·0	1·14	165	4·2	0·84	44·5	8·3
Hybrid 4	Wagad	29·2	1·15	165	4·2	0·72	42·3	7·9
Karnataka								
SI Andrews ..	Anavati	31·6	1·24	130	3·3	0·67	44·5	8·3
ELS.191	Arabhavi	27·9	1·10	126	3·2	0·77	44·0	8·2
MCU.5	,,	27·2	1·07	134	3·4	0·79	40·2	7·5
Mysore Vijaya ..	,,	27·4	1·08	126	3·2	0·73	40·7	7·8
Varalaxmi (Regular crop)	Dharwar	29.7	1.17	126	3.2	0.79	47.2	8.8
Varalaxmi (Ratoon crop)	,,	28.7	1.13	126	3.2	0.68	43.4	8.1
SI Andrews ..	Mysore	28.4	1.12	138	3.5	0.69	43.4	8.1
Varalaxmi ..	Sindhanur	32.4	1.28	122	3.1	0.64	47.2	8.8
Madhya Pradesh								
Hybrid 4	Betul	27.2	1.07	110	2.8	0.62	41.8	7.8
IAN.579-188 ..	,,	27.0	1.06	134	3.4	0.71	41.8	7.8
KW.68-2970 ..	,,	27.0	1.06	126	3.2	0.70	41.3	7.7
KW.68-2970 ..	Badnawar	27.0	1.06	126	3.2	0.66	42.3	7.9
MCU.5	,,	27.9	1.10	102	2.6	0.66	44.5	8.3
701H.452	,,	27.0	1.06	122	3.1	0.70	39.7	7.4
70IH.457	,,	27.0	1.08	114	2.9	0.69	42.3	7.9
Badnawar 1	Dhar	27.5	1.08	173	4.4	0.73	45.0	8.4
Hybrid 4	Pandhurna	29.6	1.17	157	4.3	0.76	37.5	7.0
Tamil Nadu								
CP.1998E ..	Coimbatore	27.0	1.06	169	4.3	0.71	38.6	7.2
MCU.8	Srivilliputtur	28.2	1.11	122	3.1	0.61	49.8	9.3
MCU.5	Tirupur	28.8	1.13	122	3.1	0.63	42.9	8.0

TABLE 6 : COMPARATIVE MILL AND LABORATORY TESTS — SPINNING TEST RESULTS

Place	Variety	Laboratory Results				Mill Test Results			
		Waste %	Count	Strength	t.m.	Waste %	Count	Strength	t.m.
Karnataka									
Arabhavi	Vijaya	13·0	50s	41·6*	4·0	8·0	32s	72·6	4·8
,, ...	Deviraj	10·9	50s	39·7*	4·0	10·3	32s	68·5	4·8
Dharwar Farm (rabi) ..	JK.97	13·9	40s	53·8*	4·0	10·5	40s	47·3	4·0
,, ..	JK.79	15·0	40s	52·8*	4·0	Mill reported sample missing			
,, ..	Bhagya	13·7	40s	46·7*	4·0	10·2	40s	44·4	4·0
Dharwar Agricultural College (Kharif)	JK.97	12·1	40s	52·4*	4·0	8·9	40s	46·0	4·0
,,	JK.79	13·8	40s	52·0*	4·0	8·8	40s	44·1	4·0
,,	Bhagya	12·9	40s	47·2*	4·0	8·0	40s	44·4	4·0
Maharashtra									
Achalpur	DHY.286	15·9	40s	50·8*	4·0	7·4	32s	63·7	4·8
,, ...	B.1007	13·6	40s	49·3*	4·0	8·3	32s	61·5	4·8
Akola	AKH.4	13·3	20s	91·4	4·2	6·4	28s	59·6	4·6
,, ...	AK.235	20·2	20s	75·8	4·2	10·9	28s	52·1	4·6

* SKF Drafting System.

Note : The spinning system and machinery employed by the mills are in many respects different from those adopted at this Laboratory and hence the strength values are not strictly comparable.

It will be seen that in Karnataka, Vijaya gave slightly better yarn strength than Deviraj both at the mill and the Laboratory. JK.97 and JK.79, both from Dharwar Farm (*rabi*) and Dharwar Agricultural College (*kharif*), had given better spinning performance than Bhagya at the Laboratory. But at the mills, JK.97 of Dharwar Farm (*rabi*) as well as JK.97 and JK.79 of Dharwar Agricultural College (*kharif*) gave nearly the same strength as Bhagya. In Maharashtra, DHY.286, an improved *hirsutum* variety, gave practically the same yarn strength as B.1007 both at the mill and the Laboratory. AKH.4, a new improved *desi* variety, gave better yarn strength than AK.235 at the mill as well as at the Laboratory.

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 major Trade Varieties of Indian Cottons are being obtained through the East India Cotton Association, Ltd. (EICA), Bombay, every season. Representative *kapas* samples of these varieties are procured from the State Departments of Agriculture for determination of ginning percentage. The grader's valuation and Laboratory test results on each variety of cotton were published as Technological Circulars as early in the season as possible for the information of the cotton trade and industry. Due to recent renovation of the Mechanical Processing Division of the Laboratory and censequent dislocation in work, testing of the 1973-74 season samples was delayed considerably. Therefore, the test results on these samples were combined with similar test results of the 1974-75 season samples in the relevant Technological Circular issued. During 1975, such circulars were issued on 30 Trade Varieties. Tests on the remaining varieties are in progress.

Evaluation of the Quality of Standard Indian Cotton Varieties

In order to assess the seasonal fluctuations in the characteristics of Indian cottons and with a view of judging the comparative superiority or otherwise of the newly evolved strains, a number of selected varieties of Indian cottons, called Standard Indian Cottons, are tested at the Laboratory every year. These are grown under identical conditions from year to year on Government farms under departmental supervision. Extensive fibre and spinning tests are regularly carried out on such samples. The results obtained on the samples received are published as Technological Circulars for the information of the Cotton Breeders and other research workers as early in the season as possible. As mentioned earlier, due to the recent renovation of the Mechanical Processing Division of the Laboratory and consequent dislocation in work, testing of the 1973-74 season samples was delayed considerably. Therefore, the test results on these samples were combined with similar test

results on the 1974-75 season samples in the relevant Technological Circulars issued. During 1975, such circulars were issued on five Standard Cottons. Tests on the remaining varieties are in progress.

Response of Cottons to Crosslinking Treatment with a View to Evolve Cotton Varieties Most Suitable for Chemical Finishing Treatment

Screening of Indian cottons to identify varieties suited for easy-care finishing treatments is in progress. In all seven *desi* cottons and 18 *hirsutum* cottons have been screened in the yarn form after giving standard crosslinking treatment with DMDHEU. Eight varieties (MCU.1, Gujarat 67, Hybrid 4, Deviraj, A.218, 66BH.5/91, Sanjay and Digvijay) were further screened in the fabric form after crosslinking with DMDHEU.

Figure 1 illustrates the toughness retention and wrinkle recovery angle (WRA) of DMDHEU treated fabric samples. Toughness retention which gives combined effect of strength and elongation was found to be high in fabrics made of Hybrid 4 (64%), Digvijay (53%), Deviraj (47%) and Sanjay (44%). The WRA was 223°, 275°, 263° and 283°, respectively. In the case of Sanjay the wash-wear level, i.e., 230° WRA can be achieved by reducing the resin add-on, which would also improve its mechanical properties, especially toughness. On the other hand, the WRA of Hybrid 4 can be increased by a little more resin add-on but this might bring down the toughness to some extent.

The results indicate that some *desi* cottons like Sanjay and Digvijay with their inherent more homogenous structure and circular cross-sectional shape are better suited for crosslinking. Among *hirsutum* and *barbadense* cottons also, which were studied earlier, there are cottons like Deviraj and Sujata with high elongation which may prove useful to breeders to evolve cottons better suited to crosslinking.

Study of the Effect of Crosslinking Treatments on the Structure, Number and Distribution of Crosslinks

Formaldehyde content of gel fraction of crosslinked samples (crosslinked by D and W processes) were determined. It was found that the formaldehyde content increased as the time of reaction increased. Formaldehyde contents in gel fraction of samples which were pre-swollen and then crosslinked were also determined. Formaldehyde content increased as the time of reaction increased.

Distention-index (DI) of crosslinked samples was also determined. It was found that DI decreased as the time of treatment increased both in the crosslinked as well as in pre-swollen and then crosslinked samples. These data are being analysed.

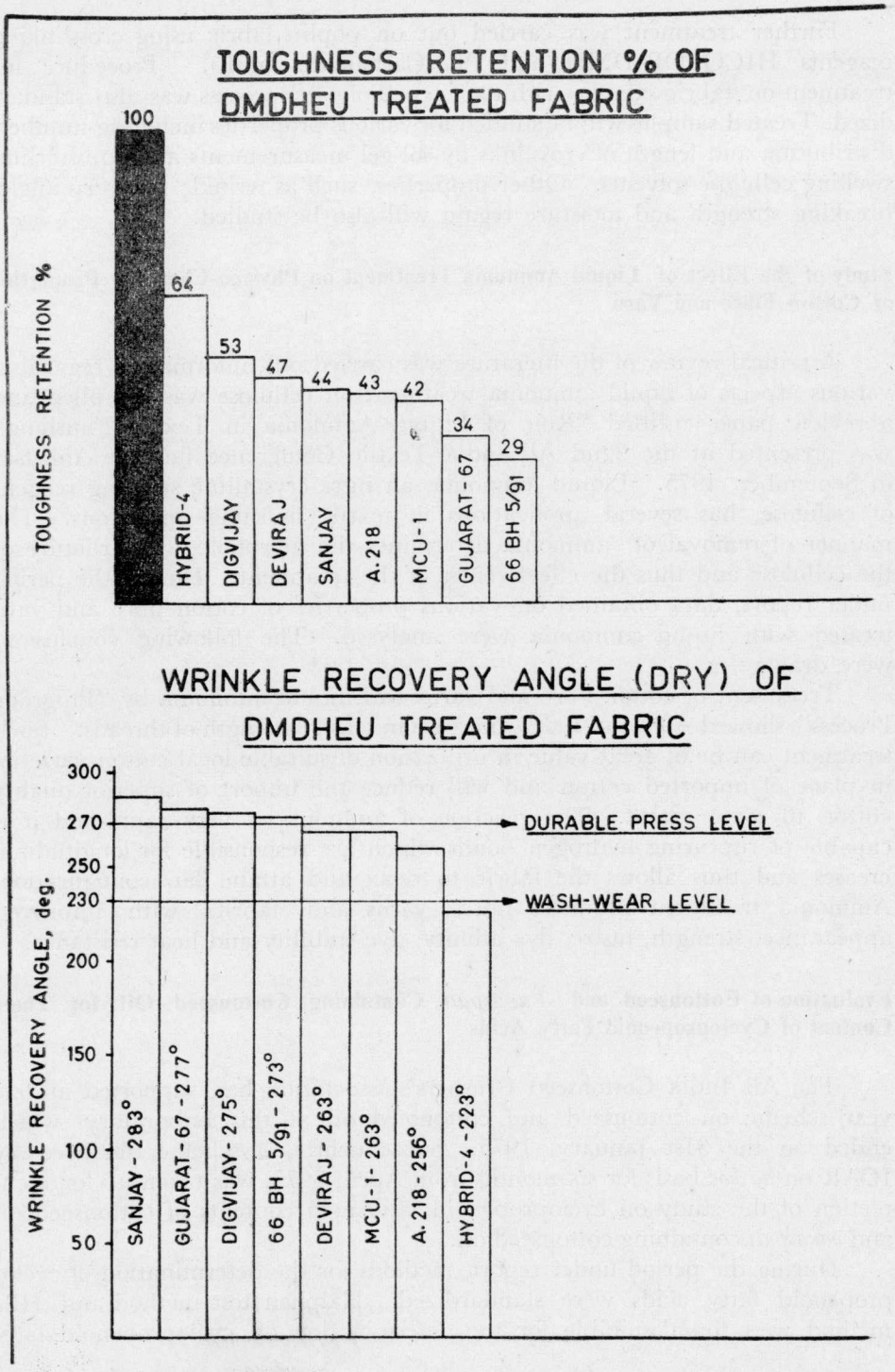


Fig. 1. Response of Cottons to Crosslinking Treatments.

Further treatment was carried out on poplin fabric using crosslinking reagents HICOFOR-DMH and PI (Carbamate finish). Procedure for treatment on fabric samples with two step 'Poly-set' process was also standardized. Treated samples will be studied for various properties including number, distribution and length of crosslinks by sol-gel measurements and equilibrium swelling cellulose solvents. Other properties, such as wrinkle recovery angle, breaking strength and moisture regain will also be studied.

Study of the Effect of Liquid Ammonia Treatment on Physico-Chemical Properties of Cotton Fibre and Yarn

A critical review of the literature was carried out, information regarding various aspects of liquid ammonia treatment on cellulose was compiled and a review paper entitled "Role of Liquid Ammonia in Textile Finishing" was presented at the 32nd All India Textile Conference held at Amritsar in September, 1975. Liquid ammonia, an intra-crystalline swelling reagent of cellulose, has several applications in textile finishing operations. The manner of removal of ammonia determines the morphological structure of the cellulose and thus the effectiveness of the treatment. During the period under report, data obtained on various properties of cotton fibre and yarn treated with liquid ammonia were analysed. The following conclusions were drawn :

Treatment of cotton fibre and yarns with liquid ammonia by "Prograde Process" showed 40% to 100% increase in tensile strength of threads. Such treatment can be of great value in utilization of suitable local cotton varieties in place of imported cotton and will reduce the import of superior quality cotton to some extent. The reaction of ammonia is very rapid and it is capable of rupturing hydrogen bonds which are responsible for longitudinal creases and thus allows the fabric to relax and attain flat configuration. Ammonia treatment produces fibres, yarns and fabrics with improved appearance, strength, lustre, dye affinity, dye stability and heat resistance.

Evaluation of Cottonseed and *Vanaspati* Containing Cottonseed Oil for Their Content of Cyclopropenoid Fatty Acids

The All India Cottonseed Crushers' Association had supported an one year scheme on cottonseed and cottonseed oil at this Laboratory which ended on the 31st January, 1975. Subsequently, a scheme, financed by ICAR on *ad hoc* basis for six months from April, 1975, was taken up for completion of the study on cyclopropenoid fatty acid contents of cottonseed oil and *vanaspati* containing cottonseed oil.

During the period under report, methods for the determination of cyclopropenoid fatty acids were standardized. Halphen test method and HBr method were found suitable for the determination of cyclopropenoid fatty

acids in cottonseed oil. A few samples of crude and refined cottonseed oil were studied for cyclopropenoid fatty acid contents. Cyclopropenoid fatty acid contents in crude and refined cottonseed oils were found in the range of 2% to 3% and 0.02% to 1.25%, respectively.

Determination of *keeping quality* of cottonseed oil and some of the other edible oils like groundnut, sesame and safflower as well as *vanaspati* were also carried out using different test methods. From the study, it was found that among the oils, sesame oil had the highest and saffola oil the lowest keeping quality. Groundnut and cottonseed oils were of intermediate order. *Vanaspati* samples had the best keeping quality, being superior to sesame oil.

Evaluation of Protein Composition of Indian Cottonseeds

Literature on the determination of amino acids by thin layer chromatography was surveyed. Cottonseeds were dehulled, and the separated kernels were finely ground. Kernel powder was freed of oil by extraction with petroleum ether and hydrolysed with 6N HCl by the standard method. Chromatograms were run on silica gel "G" coated glass plates but quantitative estimation of individual amino acids was difficult due to overlapping of the spots. Fresh hydrolyzates of the following 12 varieties were prepared: Digvijay, Gaorani 6, Hybrid 4, Laxmi, MCU.5, MCU.7, Sujata, Sujay, Suvin, Suyodhar, Varalaxmi and BC.68 × Acala-423/5215/8950 (glandless variety). Hydrolyzates were run on Automatic Amino Acid Analyser at Indian Agricultural Research Institute, New Delhi, and at Cancer Research, Institute, Bombay. The results are being analysed.

Also protein in defatted kernel powder of seven varieties was estimated by kjeldahl method. The protein content values ranged from 45.9% for Suyodhar to 55.0% for Laxmi.

Utilization of Cotton Stalks

Preliminary experimental work was carried out on utilization of cotton stalks. A simple press and suitable die were fabricated at the Laboratory. Cotton stalks were cut into small chips of different sizes. These were chemically treated with various resins in different proportions under different conditions of treatments. It was possible to prepare some types of boards in the press. But, as the pressure and temperature could not be recorded or properly regulated for preparing good quality board, efforts are being made to procure a suitable press with a pressure indicator and temperature regulation. Further, as cotton stalk is very hard, a power-operated chopper is also necessary to cut it into fine pieces.

Oxidation and Hydrolysis of Chemically Substituted Cotton Celluloses

Till now, degree of polymerisation in the case of benzoylated samples was determined by saponifying cellulose benzoate with Triton B. It was

observed that cellulose benzoate was completely soluble in concentrated sulphuric acid. Hence, an attempt was made to determine the viscosity of cellulose benzoate of varying degrees of substitution (D.S.) with Cannon-Fenske Viscometer using concentrated sulphuric acid as a solvent.

It was, however, noticed that there was not much difference in viscosity of cellulose benzoate of the highest D.S., viz. 2.9 and the lowest D.S., viz. 0.32. To ascertain whether concentrated sulphuric acid saponifies the benzoylated samples, cellulose benzoate was dissolved in concentrated sulphuric acid and then reprecipitated with water and washed. Benzoyl content of the reprecipitated cellulose benzoate was determined and was found to the higher even than that of the control. This may probably be due to be residual acid which could not be removed. Other methods are being tried.

As the spectrophotometer (Spectronic 600E) was out of order, it was necessary to resort to the gravimetric method for the determination of phosphorous content in phosphorylated fabric samples. Efforts were made to standardise the method but the method was not found suitable as the phosphorous content in the fabric samples was very low.

Cleaning of Kapas by Newly Fabricated Laboratory Extractor

During the period under report, Shirley Analyser tests were carried out on uncleaned and Laboratory Extractor cleaned samples of different varieties of *kapas*. Spinning and yarn tests on the cleaned and uncleaned samples are in progress.

The results obtained from all the tests carried out so far were analysed and the following conclusions were drawn :

1. Trash removed by the Laboratory Extractor ranged from 0.8% to 2.4% of the weight of *kapas* taken.
2. The output of clean *kapas* from the Extractor is such that it can feed two single roller gins or one double roller gin in continuous operation.
3. There was no appreciable difference in the ginning percentage between the uncleaned and Laboratory Extractor cleaned samples.
4. There was no appreciable difference in the fibre length, strength and Micronaire values between the uncleaned and cleaned samples.
5. Trash content as determined by Shirley Analyser is less in the Laboratory Extractor cleaned samples than in the uncleaned samples.

Survey of the Conditions of the Ginning Factories in India

The joint report prepared consolidating the findings of the survey conducted in the States of Gujarat, Maharashtra and Tamil Nadu has been

revised and is being published. The survey had revealed that, with a little more care and adequate inducements from the textile industry, appreciable improvement can be brought about in the ginning of cotton. Copies are, therefore, proposed to be distributed to the organisations which have contacts both with the ginning industry and textile mills or cotton trade, such as the Cotton Corporation of India, Maharashtra State Cooperative Marketing Federation, etc., for taking necessary action to effect the suggested measures for bringing about an improvement in the ginning of cotton.

Earlier steps taken to initiate similar surveys in the States of Punjab, Haryana and Rajasthan through the help of Punjab, Haryana and Rajasthan Cotton Factories' Associations did not give encouraging results. However, fresh efforts are being made to secure the help of the State Departments of Agriculture concerned in conducting the survey in these States. Necessary copies of the questionnaire forms have been supplied to them. Further work is in progress.

Studies on De-burring of Raw Wool Using Mechanical Device

Experiments conducted on small scale gave very encouraging results in the removal of vegetable impurities and there was no damage to wool hair in the process.

In order to conduct large scale trials on the raw wool samples, a commercial single roller gin has been purchased from a local firm in Bombay. The work of installation of the gin is in progress.

Isolation and Study of Thermophilic Amylolytic Micro organisms to Produce Desizing Enzymes Stable at High Temperature

A number of amylolytic organisms were isolated, out of which 14 isolates were found to exhibit good amylose activity. These organisms were identified up to species according to the scheme of Bergy's Manual of Determinative Bacteriology. The isolates comprised of six species of *Bacillus;* majority of them belonged to *B. macerans*. Along with the above cultures, *B. subtilis 54* and *B. subtilis 159*, obtained from Prof. J. V. Bhat (formerly of Indian Institute of Science, Bangalore) were also taken for the studies. *Bacillus subtilis 159* was the best amylase producer among all the isolates and hence the following studies were carried out on this culture :

In all, 19 synthetic, semi-synthetic and complex media, enriched with 0.2% starch, were tested for their suitability for amylase production. Tendler's non-synthetic (TNS) medium was found to yield maximum growth and amylase synthesis at pH 7.4.

Several carbon sources, viz. sodium salts of organic acids, alcohols and sugars were incorporated in the medium. Arabinose, inulin, maltose and sorbitol were stimulatory for amylase production.

Various inorganic nitrogen sources, viz. ammonium sulphate, ammonium nitrate, diammonium hydrogen orthophosphate, and complex nitrogen compounds—peptone, tryptone, corn steep liquor and casein hydrolysate—were added separately to nitrogen-free TNS medium. It was noticed that ammonium sulphate and peptone enhanced the amylase synthesis.

The TNS medium was modified by replacing ammonium nitrate and tryptone by ammonium sulphate and peptone, respectively, and it was also enriched with sorbitol. These modifications in the medium enhanced, about two-fold, the yield of amylase.

Production and Characterization of Cellulases

Penicillium funiculosum (F4) isolated from deteriorated cotton produces highly active cellulase enzyme. This enzyme is capable of solubilising crystalline cellulose. Characterisation of cellobiase and beta-glucosidase components of this complex enzyme was completed by fractionation using DEAE Sephadex gel chromatorgraphy technique. It was found that both the enzymes have similar characteristics and originate from the same protein, unlike some reports to the contrary in the case of cellulases from other sources.

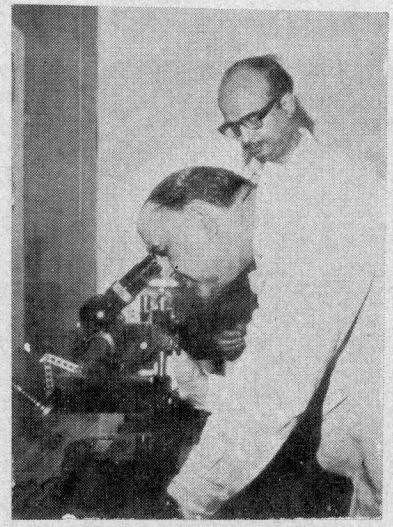
Tamarind kernel powder (TKP) is used by the textile mills for sizing of cotton warps as it is considerably cheaper than starch. However, the main constraint in wider uses of TKP or modified TKP (LTKP) is the difficulty of subsequent desizing. Presently soda-boil is recommended for removal of TKP and LTKP. Cellulase of *P. funiculosum* is highly effective in removing TKP and LTKP, as revealed by Table 7.

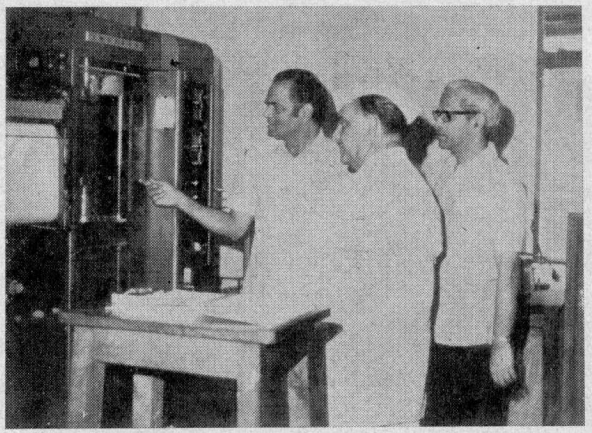
TABLE 7 : DESIZING OF TKP AND LTKP-SIZED FABRICS BY SODA-BOIL AND CELLULASE ENZYME

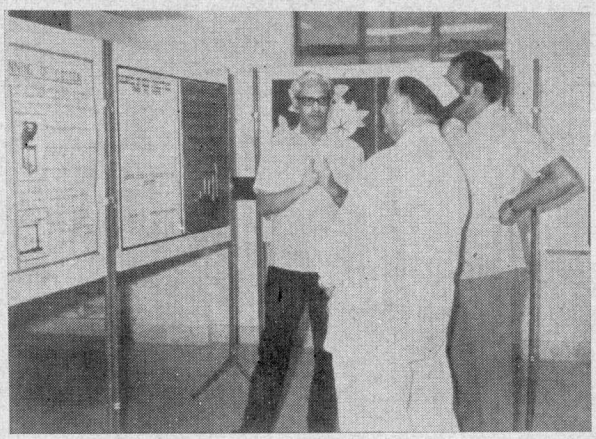
Sample		Breaking strength, lb	Size removal, %
TKP-sized	Soda-boil ..	104	86
	Cellulase ..	103	98
LTKP-sized	Soda-boil ..	212	87
	Cellulase ..	213	99

Another application of cellulase has been found in the saccharification of agricultural cellulosic waste materials. Work is in progress to grow yeast on saccharified cellulose. Table 8 summarises the saccharification brought about in six promising cases.

PLATE I

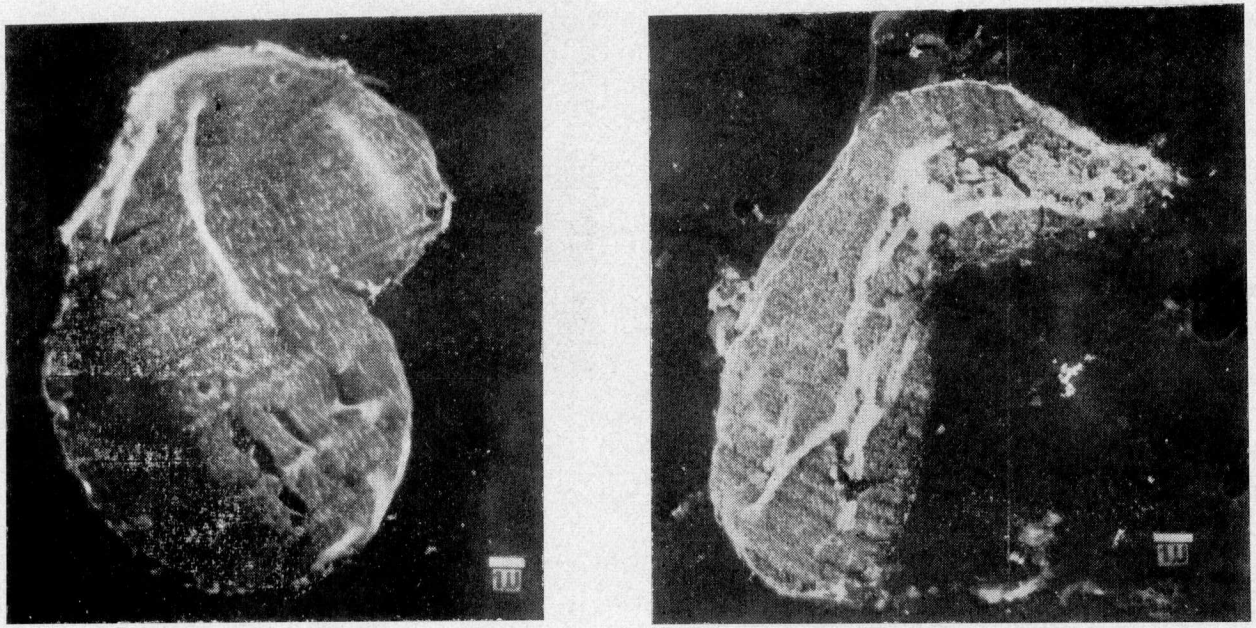






Honourable Shri Shah Nawaz Khan Visits CTRL

PLATE II



(*a*) (*b*)

Cellulase-Dissolution Technique Illustrating :
(*a*) *action on acetylated cotton of low D.S.* (*0.88*), *and*
(*b*) *action on medium DMDHEU crosslinked* (*0.71%*) *cotton.*
Note the partial dissolution of the sections indicating portions of unmodified and uncrosslinked cellulose, respectively.

TABLE 8 : SACCHARIFICATION OF BLEACHED COLLULOSIC WASTE BY *P. funiculosum*

Cellulosic waste	Reducing sugar (μg/ml)
Bagasse	3,866
Cottonseed hulls	6,872
Jute pulp	4,600
Newspaper waste	4,400
Rice husk	4,700
Wheat straw pulp	3,750

Study of the Mechanism of Enzyme Hydrolysis of Cellulose and Structural Factors Influencing Enzyme Production by Election Microscope and X-ray Diffraction

Cellulase enzyme production varies considerably with respect to substrates used, viz. cotton, linters, bagasse, wheat straw pulp and sawdust, for growing cellulase producing fungus. Electron microscopic studies are in progress to investigate whether the differences in cellulase production could be due to basic structural differences in the cellulosic substrates.

Electron microscopic micro-solubility test using cellulase enzyme has been developed to evaluate chemically modified and crosslinked cottons. This technique was compared with the conventional cuene dissolution technique widely used to evaluate the uniformity of treatment, location of reacted regions, and texture of cellulose at the ultrastructural level. Cuene being a powerful swelling agent distorts the basic morphology and texture of the original modified, crosslinked or grafted samples especially at low levels of modification, crosslinking or grafting. Cellulase on the other hand being very specific acts only on the native unaltered cellulose leaving the modified or crosslinked cotton undisturbed. Cellulase dissolution technique has, therefore, certain advantages over the cuene dissolution technique. Plate II (*a*) and (*b*) illustrates the effect of cellulase on acetylated cotton of low degree of substitution (0.88) and medium DMDHEU crosslinked (0.71 % N) cotton. The partial dissolution of the cross-sections can be seen.

An electron diffraction technique to determine crystallinity has been standardised to overcome the deterioration due to electron beam, by minimizing the exposure time to as little as 3 sec.

Crystallite Orientation in Textile Fibres as Studied by Their Meridional (040) X-ray Diffraction Arcs

Results obtained on native cottons indicated that convolution angle and circularity were highly correlated with spiral angle. On the other hand,

the crystallite dispersion angle did not show any such relation with the morphological parameters.

The observed differences in crystallite orientation could not entirely be explained by variations in the considered morphological parameters.

The spiral angle obtained by optical methods showed good correlation with the De Luca and Orr spiral angle obtained by resolving the x-ray orientation profiles.

Work on chemically modified samples is in progress.

Some Optical and X-ray Studies on Cotton Fibres

Refractive indices and x-ray orientation factor are being determined for seven varieties of cotton, both in their raw state as well as after swelling and stretching treatments in NaOH. The treated samples comprise slack swollen fibres and fibres stretched to 0%, 5% and 7% above their initial lengths during swelling. The principal refractive indices were determined by using the Fibre Refractometer with light of wavelength 5000Å. The x-ray orientation factor is obtained by an established method usually followed in this Laboratory. Table 9 gives the results of measurements which have so

TABLE 9 : OPTICAL AND X-RAY MEASUREMENTS ON COTTON FIBRES

Treatment and Properties / Cotton	Raw $\triangle n(fx)$	Slack $\triangle n(fx)$	0% $\triangle n(fx)$	5% $\triangle n(fx)$	7% $\triangle n(fx)$
MCU. 2	0·054 (·73)	0·043	0·051	0·053 (·80)	0·052 (·81)
Digvijay	0·054 (·71)	0·042	0·051	0·053 (·82)	0·050 (·81)
SI. Andrews	0·052 (—)	0·042	0·049	0·053 (·87)	0·054 (·83)
Sujata	0·051 (·67)	0·042	0·051	0·054 (·86)	0·053 (·83)
USA Acme	0·052 (·65)	0·042	0·049	0·053 (·85)	0·052 (·83)
Laxmi	0·050 (·64)	0·041	0·050	0·055 (·84)	0·053 (·81)
Nimbkar	0·046 (·60)	0·042	0·049	0·051 (—)	0·051 (—)

Slack : fibres slack swollen in NaOH of 24% w/w concentration.
0% : fibres swollen in 24% NaOH and stretched to 0% above initial length.
5% : fibres swollen in 24% NaOH and stretched to 5% above initial length.
7% : fibres swollen in 24% NaOH and stretched to 7% above initial length.

far been completed. While the optical measurements are completed for the entire set of samples, the x-ray results indicated therein pertain only to some of the samples included in the study. Although a detailed analyses of the results is possible only after obtaining complete x-ray data on the remaining samples, some observations could be made at this stage. It is found that

although the seven cottons were of widely different initial birefringence ranging from 0.046 to 0.054, the range narrowed down to 0.041-0.043 on swelling in NaOH in the slack state, and to 0.049-0.051 on stretching to original length after NaOH treatment. Samples stretched to 5% and 7% over their original lengths also fell within narrow ranges of birefringence values, namely 0.051-0.055 and 0.050-0.054, respectively. These results seem to suggest that the differences in orientation among different cottons in the raw state are mainly due to the varying influence of convolutions because, on removal of these convolutions by swelling in the alkali, the differences are considerably reduced. Another aspect of the results is that the birefringence increases with stretch up to 5% signifying an increase in fibrillar orientation; further stretch appears to lead to a partial disorientation. The latter trend is also observed in the x-ray orientation factor which shows a general reduction as a result of stretch beyond 5%. A thorough analysis of the results is possible only after completion of x-ray measurements currently in progress.

Studies on the Lateral Compressibility of Chemically Modified Cotton

Changes brought about by crosslinking on the lateral compression modulus and longitudinal extension modulus of cotton are being studied. As the lateral compression measurement *per se* demands fibres of circular cross-section, it was necessary to use mercerised fibres as starting material. As fibres stretched during mercerisation were found to have more circular cross-sections and better uniformity along their lengths, initial experiments were conducted on fibres stretched to 5% during swelling in NaOH. The stretch mercerised fibres were tested for the two moduli both before and after crosslinking in 10% formaldehyde (CH_2O) under conditions in which a high degree of crosslinking was expected. Results are given in Table 10. For each sample indicated in Table 10, the compression modulus is the average of the values obtained on 8 pairs of fibres and the longitudinal modulus is the average of the results on 30 individual fibres.

TABLE 10 : CHANGES BROUGHT ABOUT BY CROSSLINKING ON LONGITUDINAL AND LATERAL MODULI OF COTTON FIBRE

Sample	Longitudinal modulus (x 10^{10} dynes/cm^2)	Lateral modulus (x 10^{10} dynes/cm^2)
Cotton control (Sujata—NaOH 5% stretch)	25·0	3·34
Control crosslinked with 10% CH_2O ..	27·6	3·81
Control crosslinked with 20% CH_2O ..	26·5	—

It is apparent from Table 10 that the above chemical treatment failed to bring about any change in the moduli. Since the conditions chosen for the reaction were such as could result in a high degree of crosslinking and a consequent drop in the longitudinal modulus in the case of slack mercerised fibres, it was suspected that the treatment was ineffective in the present case. The treatment was, therefore, repeated at an enhanced concentration of 20% CH_2O but still there appeared to be no effective crosslinking as the longitudinal modulus remained unaltered. Compression measurement was not made on this sample as it was evidently unnecessary. It was thus obvious that the reaction did not readily take place in the stretch mercerised cotton fibre for some obscure reason.

No further tests were conducted on these samples and it was decided to employ slack mercerised cotton as the control material instead of the stretch mercerised cotton and crosslinking was carried out at two concentrations of CH_2O, namely 10% and 20%, for 20 minutes at room temperature. While the test for longitudinal modulus is over for the control and the two treated samples, the lateral compression measurements are still incomplete. It is seen from Table 11 that the longitudinal modulus falls considerably as a result of the treatment which clearly shows that the reaction has indeed taken place in the two cases.

TABLE 11 : CHANGES BROUGHT ABOUT BY CROSSLINKING ON LONGITUDINAL AND LATERAL MODULUS

Sample	Longitudinal modulus (x 10^{10} dynes/cm^2)	Lateral modulus (x 10^{10} dynes/cm^2)
Cotton control (Sujata—slack swollen in NaOH)	13·03	3·44
Control crosslinked with 10% CH_2O ..	5·08	—
Control crosslinked with 20% CH_2O ..	3·88	—

A Study of the Strength of Attachment of Fibres on the Seeds of Varying Fuzziness

Fourteen cottons belonging to different botanical species and with varying degrees of fuzz index, were tested during the period. The work done in pulling a small, carefully parallelised bundle of fibres from the side region of a seed was measured on the Instron Tensile Tester. A total of 100 observations were made for each variety. The fuzz index of each variety was also determined following the chemical method adopted in the Laboratory. The

results showed that for all varieties, the work done in pulling 100 fibres varied widely from seed to seed. It was further observed that there was no relationship between the strength of attachment of fibres and fuzziness of seeds.

Studies on Linear Density and Its Influence on Fibre Tenacity

For native cotton fibres, factors such as cross-sectional shape, stiffness, etc., have next to no effect on the resonance frequency and hence on the results of linear density determined by the vibroscopy method.

Under 'favourable' agro-climatic conditions, the growth of fibres within the bolls, as measured by the increase in linear density, was very rapid and was complete during the growth period of 30-35 days. Under 'adverse' conditions, however, the thickening of cell-wall continued to take place almost up to boll opening.

The fibres with linear density both below and above a certain range, around the average linear density for a cotton, recorded an appreciable increase in the wet strength compared to the dry. On the other hand, those having a linear density around the average recorded a very marginal increase or even no increase at all in their wet strength.

Studies on Fibre Elongation Characteristics of the Different Varieties of Indian Cottons

Ten samples each of *G. arboreum*, *G. herbaceum*, *G. hirsutum* and *G. barbadense* species were tested for the bundle strength at $\frac{1}{8}$ in. gauge and percentage breaking elongation on the Instron Tensile Tester. The Stelometer test results on these samples have been reported in the last Annual Report. Comparative data are reported in Table 12.

TABLE 12 : BUNDLE STRENGTH AND PERCENTAGE ELONGATION BY STELOMETER AND THE INSTRON TENSILE TESTER

Species	Stelometer		Instron Tensile Tester	
	Bundle strength at 1/8 in. gauge (g/tex)	% elongation	Bundle strength at 1/8 in. gauge (g/tex)	% elongation
G. hirsutum	23·4	6·2	23·4	6·6
G. herbaceum	25·2	5·4	26·0	5·8
G. arboreum	24·8	5·8	24·6	5·7
G. barbadense	31·6	8·2	31·6	8·2

The strength and elongation values determined using Stelometer were practically on par with those obtained using the Instron. The correlation coefficients between strength values determined using Stelometer and Instron (0.79) and between elongation values determined using the two instruments (0.94) were highly significant.

Fabrication of a Lint Opener

Fourteen samples were opened both by hand and by the newly designed opener. These samples were tested for Micronaire fineness and maturity. Generally, the opening of the samples by the lint opener was as efficient as the hand-opening, as revealed by the above tests. In the case of very fine varieties, some variation in fineness was observed between these methods.

In order to speed up the work of opening samples, the lint opener was fitted with electric motor drive. Further comparative tests are in progress.

Preparation of Nep Grades for Indian Cottons

Nep grades for each of the five samples of very coarse, average and fine groups were determined on the Nepotometer. From the results it was decided to take Comillas, Hybrid 4 and 320F cottons for preparation of photographic standards for respective groups. Further, with a view to examine whether two cottons (320F and Comillas) selected for preparing photographic standards for extreme groups when mixed in different proportions by weight give the intermediate nep grades systematically, they were mixed in 50 : 50 and 25 : 75 proportions by weight on mechanical blender and nep grades of the mixings were determined. It was observed that nep index for the two mixings was 30 and 50 (neppy and fairly neppy), respectively, as against 10 and 100 (very neppy and free of neps) for individual cottons.

In addition, it was considered necessary to compare the web formed on carding machine and the Nepotometer in order to judge agreement between the two types of webs. Tests a on few cottons indicated that the two types of webs are not directly comparable.

Twentyfour samples belonging to Standard and Trade Varieties of Indian Cottons in the coarse and superfine count ranges were studied. Neppiness of the material from raw cotton to yarns was assessed using different methods as per approved technical programme. The data for these cottons as well as twentysix samples processed earlier were analysed and relationships between different methods of nep evaluation were worked out. The results indicated highly significant correlations between the various methods as given in Table 13. It was also noticed that the neps in raw cotton increased in the blow room lap but reduced in carding and drawing slivers. A tendency to increase was noticed at slubber and inter stages and in yarns of finer counts as shown in Figure 2.

TABLE 13 : CORRELATION BETWEEN DIFFERENT METHODS OF NEP EVALUATION

x	y		Correlation coefficient to r_{yx}	No. of samples
Nepotometer Index	Neps in Card Web (Shirley Template)		—0·64**	26
- do -	Neps in Blow Room Lap		—0·63**	26
- do -	Neps in Raw Cotton		—0·57**	26
Neps in Card Web (Shirley Template)	Neps in Card Sliver (Overall) (Readex)		+0·68**	50
- do -	Neps in Card Sliver (*arboreum* and *herbaceum*)		+0·50·*	20
- do -	Neps in Card Sliver (*hirsutum* and *barbadense*)		+0·73**	30
Neps/km (Uster)	Neps/km (Readex)	20s	+0·77**	15
- do -	- do-	30s	+0·63**	17
- do -	- do -	40s	+0·68**	16
Neps/g (Uster)	Neps/g (Readex)	20s	+0·74**	15
- do -	- do -	30s	+0·62**	17
- do -	- do -	40s	+0·66**	16
Yarn Appearance Index	Neps/km (Uster)	20s	—0·82**	15
- do -	- do -	30s	—0·75**	17
- do -	- do -	40s	—0·80**	16
- do -	- do -	60s	—0·70**	18
- do -	- do -	80s	—0·45 (N.S.)	15
Yarn Appearance Index	Neps/km (Readex)	20s	—0·91**	15
- do -	- do -	30s	—0·65**	17
- do -	- do -	40s	—0·81**	16
- do -	- do -	60s	—0·39 (N.S.)	18
- do -	- do -	80s	—0·55*	15

* Significant at 5% level.
** Significant a 1% level.
(N.S.) = Not significant.

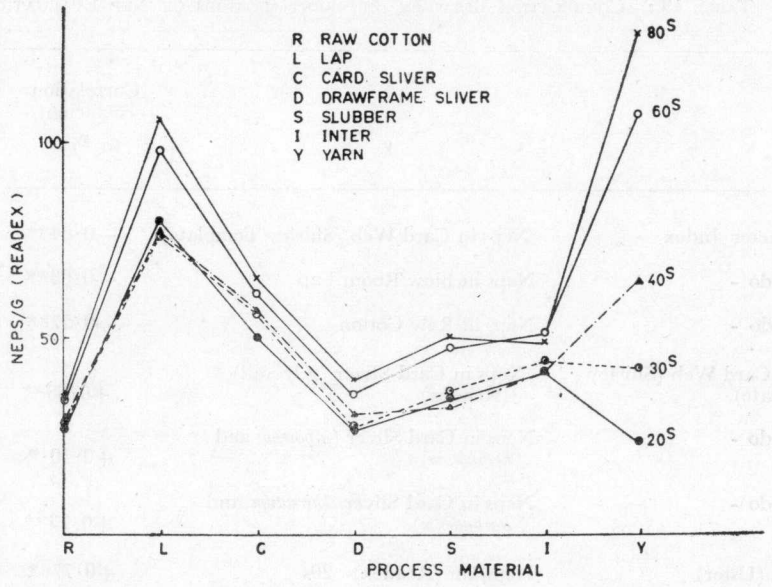


Fig. 2. Neps at Different Stages of Processing

Study on the Quality of Samples from Entomological Trials

In the last Annual Report it was stated that efforts would be made to continue the study of Suvin and MCU.5 varieties on the same lines as Sujata after collecting sufficient data from ensuing seasons. As further samples were not available, it was deciced to analyse the data so far collected on Suvin and MCU.5 varieties and to draw possible conclusions. These are given below :

Nine samples of MCU.5 variety of 1970-71 season were received without a control sample; no significant difference in fibre quality was observed between the treatments.

When test results of six samples of Suvin variety of 1971-72 season were subjected to statistical analysis, it was observed that only fibre length was affected significantly with *Phosalone*, *Monocrotophos* and *Quinalphos* treatments. Similarly, *Phosalone* and *Monocrotophos* treatments resulted in reduced strength when compared to the standard although the change was not significant (Table 14).

TABLE 14 : EFFECT OF DIFFERENT INSECTICIDAL TREATMENTS ON FIBRE LENGTH AND BUNDLE STRENGTH OF SUVIN COTTON DURING 1971-72 SEASON

Treatments	2·5% span length (in.)	Bundle strength (g/t) at 1/8 in. gauge length
Quinalphos / Carbaryl	1·43	36·4
Endosulfan (Standard) / *Carbaryl*	1·47	36·8
Fenitrothion + Malathion / Carbaryl	1·45	36·3
Carbaryl + Molasses / ,, ...	1·45	36·4
Phosalone / ,, ...	1·41	35·7
Monocrotophos / ,, ...	1·44	34·2
Critical difference	0·03	2·6

In the case of 14 samples of Suvin variety belonging to 1972-73 season, it was observed that variations in mean fibre length and fibre strength at 1/8 in. gauge showed a tendency of increase in fibre length and reduction in strength as compared with the control.

Thus, it could be concluded from the available data for two varieties, Sujata and Suvin, from different seasons, that fibre length and fibre strength at 1/8 in. gauge are the two properties influenced by the insecticide treatments.

Studies on Physical Characteristics of Cotton Blends

In the previous Annual Report, it was mentioned that two varieties of cotton, namely C. Indore 1(X) and A.51-9(Y) which had almost identical fibre characteristics except Micronaire value, had been taken up for this study and that fibre tests and yarn tests, except yarn grading, had been carried out. During the period under review, the yarns of the two control and three blended samples were evaluated for grade according to the ASTM standards. The test results are given in Table 15.

TABLE 15 : FIBRE AND YARN CHARACTERISTICS OF C. INDORE 1 (X), A. 51-9 (Y) AND BLENDS OF C. INDORE 1 AND A.51-9

Blends	(X) 100%	(X+Y) 75%/25%	(X+Y) 50%/50%	(X+Y) 25%/75%	(Y) 100%
Fibre Properties					
Micronaire value	4·4	4·1	3·9	3·7	3·5
Yarn Properties					
Lea Strength Test					
Strength (lb)	93·1	101·6	104·3	105·7	125·1
Count (Ne)	20·5	20·3	20·4	20·9	20·3
Corrected CSP	1,928	2,073	2,143	2,243	2,551
Uster Single Yarn Strength Test					
Tenacity (g/tex)	12·0	12·7	13·4	13·9	15·6
Elongation %	7·4	7·7	8·2	7·8	7·4
Uster Evenness (125 metres)					
U%	15·0	15·2	14·6	15·0	14·6
Thin places	7	1	4	4	5
Thick places	73	55	63	84	84
Neps	132	130	142	163	166
Total Imperfections	212	186	209	251	255
ASTM visual appearance grade	D	+ D	C	+ D	D
,, ,, ,, Index ..	70	80	90	80	70

It may be seen from Table 15 that the blend of 75 % X and 25 % Y gave yarn with poor quality. Blend of 50 % X and 50 % Y yielded yarn with CSP of 2,143 with low neps (142) and average grade (C), while 25 % X:75 % Y blend gave yarn with higher CSP because of increase in proportion of finer cotton but produced larger number of neps, resulting in lower yarn grade. Hence, it may be concluded that cottons differing in fineness can be blended suitably to produce good quality yarns.

This project was extended to study the effect of blending cottons of differing Micronaire value on the nep formation. For this purpose, seven varieties of Indian cottons varying in Micronaire value from 3.0 to 6.5 were selected and were blended with each other in 50 : 50 proportion using the Cotton Blender. Each of these blends was processed through the Nepotometer and their nep grades were ascertained. It was observed that, in general, the resultant nep grades were intermediate with respect to the controls.

Studies on Blends of Indian Cotton with Polyester Fibre

Blending of the new variety of cotton, Suvin, with 1.2 denier polyester fibre was carried out in the proportions of 67 : 33, 50 : 50 and 25 : 75 polyester-cotton. The individual components and the blends were spun to 80s. Testing is in progress.

Studies on Spinning from Blends of Cotton with Wool, Jute and Ramie on Cotton System

Samples of Shyamali cotton were blended with jute caddies in the proportion 100 : 0, 50 : 50 and 67 : 33. The blended samples were processed using microspinning technique and spun to 6s on three roller drafting using twist multiplier (TM) 4, 5, 6, 7 and 8 to study the effect of TM on yarn strength. The test results of the above samples are given in Table 16.

Study of Quality of Material at Different Stages of Processing

The study of quality of material at different stages of processing on three cottons in each count group of 20s, 30s, 40s, 50s and 100s was completed and the following conclusions were drawn : (*i*) Among the four different drafting systems studied, quality of yarns spun on SKF drafting system was found to be the best; (*ii*) yarns spun on top-arm drafting system were found to be superior to those spun on A-500 and 3-roller systems. A paper entitled, "Comparative performance of different drafting systems at Ring Frame" has been sent for publication.

In addition, study on influence of some fibre length parameters on the long term variations in the yarn has been carried out and it was observed that though length parameters had considerable influence on the overall irregu-

TABLE 16 : TEST RESULTS ON SPINNING FROM BLENDS OF SHYAMALI COTTON WITH JUTE CADDIES

	TM	Breaking load (g)	Tex	Tenacity (g/t)	Breaking extension (%)
100% Shyamali	4	1,018	105·60	9·64	10·00
	5	1,062	97·90	10·85	11·57
	6	1,156	99·20	11·65	14·13
	7	923	94·80	9·74	15·00
	8	961	100·30	9·58	19·06
50% Shyamali + 50% Jute Caddies	4	676	96·50	7·00	6·73
	5	738	98·90	7·46	8·05
	6	685	98·90	6·93	9·05
	7	818	98·10	8·34	12·25
	8	687	101·80	6·75	12·05
67% Shyamali + 33% Jute Caddies	4	779	97·30	8·01	7·44
	5	1,000	97·60	10·25	10·00
	6	946	93·70	10·10	11·06
	7	1.013	104·30	9·71	15·59
	8	799	99·20	8·05	14·96

larity in terms of Uster U % value, they did not appear to have any correspondence with long term variations present in the yarn. A short note on this investigation has been accepted for publication in Journal of Textile Association.

Standardisation of Imperfection Indicator

The data collected earlier are being analysed and further study was carried out for understanding the relationship between visual assessment of yarn appearance and the Uster details in terms of Uster value (U %) and imperfections (thin places, thick places and neps). However, the work had been carried out on yarns of 20s and 30s counts. In order to examine whether finer yarns exhibit similar relationship or not, it was proposed to extend the study for finer yarns of 80s and 100s counts. During the period, 20 samples of 80s and eight samples of 100s were tested for Uster evenness and imperfections. The samples were also tested for single thread strength, lea strength and yarn appearance grade by ASTM method. It is proposed

to carry out tests on 20 samples of 100s count, before the data are finally analysed.

Effect of Different Systems of Processing on the Spinning Performance of Superior Quality Cottons

Analysis of the fibre data for combed slivers from the different cottons indicated that the fibre length of the combed sliver showed distinct improvement over that of the comber lap. Between the various levels of comber waste, Giza 45 showed no marked increase in length with increase in comber waste extraction up to 12 % waste extraction, while Hybrid 4 showed maximum improvement at 24%. However, no definite trend was noticed in the case of Sujata and Sudan XG2VS (Fig. 3).

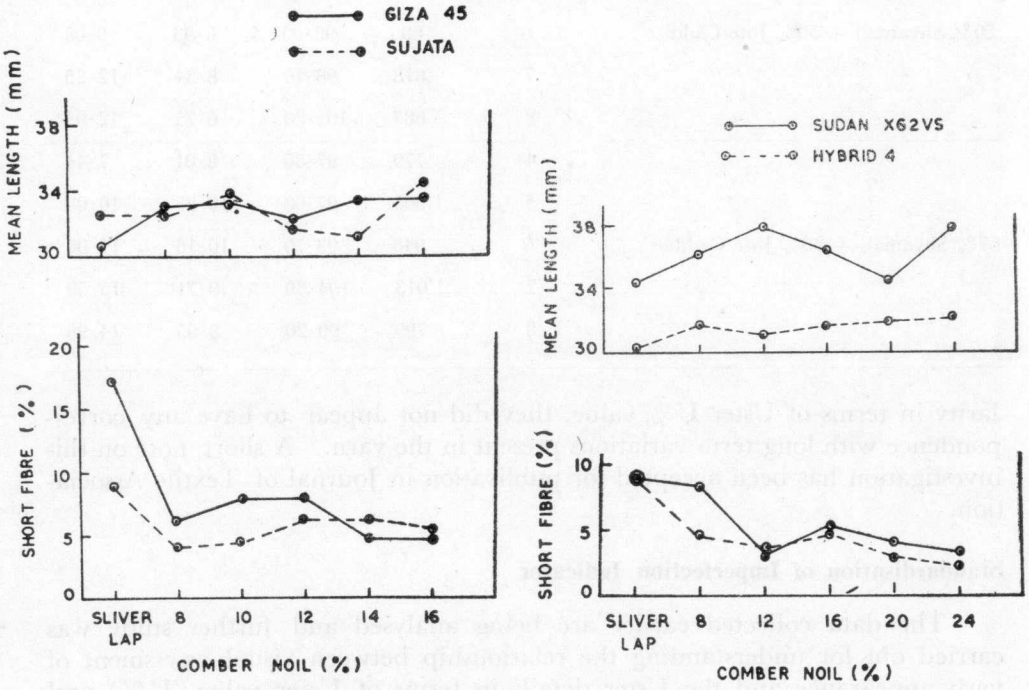


Fig. 3. Effect of Comber Waste Removal on Fibre Length of Comber Slivers

From the point of view of yarn strength and evenness, the optimum waste extraction level for the various cottons appeared to be about 12% to 14% for Giza 45, 12% for Sujata and Sudan XG2VS, and 16% to 20% for Hybrid 4.

Comparison of Different Systems for Processing Cotton Samples

During the period under report, 42 samples in duplicate lots were spun to different counts (20s, 30s, 40s, 50s and 60s) using microspinning technique for comparison with the yarns spun to the same counts on bulk spinning. The yarns spun were tested for lea strength. Further work is in progress.

Fixation of Suitable Strength Standards for Estimation of Spinning Performance of Improved Varieties

Comparative spinnings of SKF drafting system and Casablanca A-500 drafting system were completed for about 10 samples of 50s, six samples of 60s and five samples of 80s yarns. While single end feed was employed for both the systems in 50s, double end feed was employed for 60s and 80s on Casa A-500 drafting system alone so as to conform to the procedure followed earlier by this Laboratory for spinning superfine counts. The average percentage differences in lea CSP for 30s, 40s, 50s, 60s and 80s between the two systems based on CSP of yarn spun on A-500 system were observed to be are 14.5%, 14.2%, 17.2%, 11.1% and 11.1%, respectively.

A Study of the Performance of the Modern Blow Room Line

Studies on different blow room combinations were completed for two cottons, Hybrid 4 and Krishna, the former being spun to 50s and the latter to 40s. It was observed that the blow room combinations employing Shirley Opener gave higher cleaning efficiency as compared to those using Airstream Cleaner. Studies on two combinations of blow room were completed for an extra-long staple cotton, Suvin. The results are being analysed.

Estimation of Rate of Fall of CSP at Various Counts for Long and Extra-long Staple Varieties of Cotton (above 25 mm)

The present investigation is to determine a correction factor 'K' which is the average decrease in CSP units for unit increase in yarn number. It has been observed that this factor is not uniform for all ranges of counts.

Test results of about 94 samples spun to 50s and 60s counts, 31 samples spun to 60s and 70s counts, 13 samples spun to 70s and 80s counts were used for analysis. The correlation coefficient was worked out between the average fall in CSP and the average count and found to be quite high (0.94).

The equation connecting K with the average count C was found to be :

$$K = -0.54C + 52.12.$$

As each cotton had been spun to only 2 counts, the data available were inadequate to take into account the change in the rate of fall of CSP at different counts. The question is being examined further.

RESEARCH WORK DONE AT REGIONAL STATIONS

DHARWAR

The effect of succinic acid at various concentrations was studied on the yield and quality of cotton at Dharwar and Arabhavi during 1973-74. Soaking seed in 1 % succinic acid produced higher yield than all the other treatments. Fibre quality was unaffected.

Cycocel (CCC) of 20, 40, 60 and 80 g ai/ha concentrations was applied at 60 days, 92 days, square stage and boll formation stage. Highest yield was obtained with 60 g ai/ha at 60 days after sowing. The effect of CCC on the fibre is being studied.

NANDED

In spacing-cum-manurial trial on ND.9 cotton conducted at Parbhani, closer spacing without nitrogen showed slight improvement in fibre length and bundle strength.

SURAT

The consolidated data for four seasons (1971-74) pertaining to the project "Genetical selection for fibre strength" were statistically analysed. It was observed that the varieties exhibited wide variation in their within plant (seed-to-seed) as well as between plants (plant-to-plant) values for bundle strength. Within plant variation in *hirsutum* varieties was comparatively less than in *herbaceum* varieties. Between plant variations were of the same magnitude in both the species.

III. Publications

During the period, one Annual Report and 16 Research Publications were published, while 35 Technological Circulars were issued. Further, eight articles were published in various journals, conference proceedings, etc., and 12 articles were sent for publication.

A. Annual Report

Annual Report of the Cotton Technological Research Laboratory for the calendar year 1974.

B. Research Publications (CTRL Publication—New Series)

No. 51. Interferometric Fibre Stapler : Further studies—by K. R. K. Iyer and G. F. S. Hussain (reprinted from *Journal of Textile Association*, September, 1974 issue).

No. 52. Enzymic hydrolysis of cotton and crystalline cellulose—by S. M. Betrabet, V. G. Khandeparkar and N. B. Patil (reprinted from *Cellulose Chemistry and Technology*, April, 1974 issue).

No. 53. Effect of phosphoric acid treatment on physical and chemical properties of cotton fibre—by S. N. Pandey and (Smt.) Prema Nair (reprinted from the Proceedings of the 30th All India Textile Conference, October, 1973).

No. 54. Technological performance of new cotton varieties. Part II : MCU.5 Cotton—by P. G. Oka and V. Sundaram (reprinted from *Cotton Development Journal*, January, 1975 issue).

No. 55. Studies on some physical parameters of cotton fibre and their influence on breaking strength—by G. S. Patel and N. B. Patil (reprinted from *Textile Research Journal*, February, 1975 issue).

No. 56. Influence of some of the physical and fine structural characteristics on the strength uniformity of native cotton—by A. Rajagopalan, N. B. Patil and V. Sundaram (reprinted from Proceedings of the 15th Joint Technological Conference).

No. 57. X-Ray studies on orientation of crystallites in native cottons—by P. K. Chidambareswaran, N. B. Patil and V. Sundaram (reprinted from Proceedings of the International Textile Seminar, Textile Association, Delhi Branch, January, 1973 issue).

No. 58. Estimation of cotton fibre maturity using Micronaire by a new technique—by K. N. Seshan, Harirao Navkal and V. Sundaram (reprinted from *Journal of Textile Association*, March, 1975 issue).

No. 59. Technological evaluation of improved varieties of cotton in Karnataka—by M. S. Sitaram, P. G. Oka, V. G. Munshi and V. Sundaram (reprinted from *Mysore Journal of Agricultural Science*, Vol. 8, 1974 issue).

No. 60. Development of extra-long staple *G. barbadense* varieties in India—by R. Krishnamourthy, V. Santhanam, V. Sundaram, K. V. Srinivasan, G. Veda Moorthy and K. Shanmugham (reprinted from *Cotton Development Journal*, July, 1975 issue).

No. 61. Effect of zinc chloride solution on swelling and other properties of cotton—by S. N. Pandey and (Smt.)Prema Nair (reprinted from Proceedings of the 15th Joint Technological Conference).

No. 62. Studies in physical characteristics of cotton blends—by S. R. Ganatra, V. G. Munshi and B. Srinatan (reprinted from *Indian Textile Journal*, April, 1975 issue).

No. 63. Instrumental grading of raw cotton—by V. G. Munshi (reprinted from *ISI Bulletin*, Vol. 26, No. 7, 1974 issue).

No. 64. Study on relationship between oil, protein and gossypol in cottonseed kernels—by S. N. Pandey and N. Thejappa (reprinted from *Journal of American Oil Chemists' Society*, Vol. 52, No. 8, 1975 issue).

No. 65. A study on the effect of anhydrous liquid ammonia treatment on cotton— by S. N. Pandey and (Smt.) Prema Nair (reprinted from Proceedings of the 16th Joint Technological Conference held in January, 1975).

No. 66. Place and environment effect on seed weight and oil content of cottonseed—by S. N. Pandey and N. Thejappa (reprinted from *Mysore Journal of Agricultural Science*, Vol. IX, No. 1, 1975 issue).

C. Articles and Papers

(*a*) *Published*

1. Effect of soil and climatic conditions on fibre properties of American cotton—by A. K. Antony and E. Keshavankutty (*Indian Journal of Agricultural Science*).

2. Comparative performance of different single yarn testing instruments—short communication—by V. G. Munshi (*Journal of Textile Association.*).

3. बिनौला भी उपयोगी है—एस्. एन्. पांडे (**खेती**) ।

(*b*) *Presented at Conferences/Seminars*

1. Role of liquid ammonia in textile finishings—by S. N. Pandey (presented at the 32nd All India Textile Conference held at Amritsar, in September, 1975).

2. Staple length classification of cottons in India : Proposals for revision—by V. Sundaram (AICCIP Seminar-cum-Workshop on Cotton Improvement Research, Nagpur, October, 1975).

3. Varietal response of Indian cottons to mercerisation and chemical finishing—by S. M. Betrabet (AICCIP Seminar-cum-Workshop on Cotton Improvement Research, Nagpur, October, 1975).

4. Infrared bands and cellulose crystallinity : A new IR Index for measuring crystallinity of native cellulose—by (Smt.) P. Bhama Iyer, K. R. Krishna Iyer and N. B. Patil (17th Joint Technological Conference at SITRA Coimbatore).

5. Evaluation of techniques for measurement of neps—by P. K. Jairam, M. S. Parthasarathy and V. Sundaram (17th Joint Technological Conference at SITRA, Coimbatore).

(*c*) *Sent for Publication*

1. Cellulolysis of cotton fibre in Indian environment and cellulase enzyme—by S. M. Betrabet (*Journal of Scientific and Industrial Research*).

2. Studies on chemically modified cotton. Part V : Effect of zinc chloride solution on swelling and other properties—by S. N. Pandey and (Smt.) Prema Nair (*Journal of Applied Polymer Science*).

3. An infrared technique for the quick analysis of cotton: polyester blends—by (Smt.) P. Bhama Iyer, K. R. K. Iyer and N. B. Patil (*Journal of Applied Polymer Science*).
4. Order in cellulose fibres—by P. K. Chidambareswaran, N. B. Patil and V. Sundaram (*Journal of Applied Polymer Science*).
5. Cellulase dissolution technique for the study of chemically modified and crosslinked cotton—by S. M. Betrabet and K. M. Paralikar (*Journal of Applied Polymer Science*).
6. Irradiation of cellulose in presence of various radio sensitive and radio protective chemicals—by (Kum.) I. G. Bhatt, V. Sundaram, Jai Prakash, (Smt.) V. Iyer and A. W. Shringarpure (*Colourage*).
7. Microprojecta—a project outfit for optical microscope— by V. G. Munshi (*IMDA*).
8. The effect of insecticidal treatments on the quality of Sujata cotton—by V. G. Munshi and (Smt.) S. B. Pai (*Indian Journal of Entomology*).
9. Influence of some fibre length parameters on the yarn long term variations—short communication—by A. V. Ukidve, P. G. Oka and (Kum.) C. R. Raje (*Journal of Textile Association*).
10. Guidelines for nomenclature of cotton strains and varieties—by V. Sundaram (*Cotton Development Journal*).
11. Effect of cycocel (CCC) on the fibre quality of H.14 cotton—by S. N. Nagwekar, M. S. Kairon and D. K. Jain (*Indian Journal of Agronomy*).
12. A note on the effect of fertilizers, sowing dates and spacings on yield and fibre properties of cotton varieties H.14 and J.34 (*G. hirsutum*)—by S. N. Nagwekar, M. S. Kairon and D. K. Jain (*Indian Journal of Agronomy*).

D. Technological Circulars

1. Nos. 1795 to 1824 on Trade Varieties of Indian Cottons.
2. Nos. 114 to 118 on Standard Indian Cottons.

TRADE VARIETIES OF INDIAN COTTONS

T.C. No.	*Variety*	*T.C. No.*	*Variety*
1795	Buri 1007	1797	Desi—Punjab
1796	G.6 (Bhainsa)	1798	Sanjay (Botad)

TRADE VARIETIES OF INDIAN COTTONS(*Contd.*)

T.C. No.	*Variety*	*T.C. No.*	*Variety*
1799	Buri 147	1812	Maljari
1800	Laxmi (Phaltan)	1813	Digvijay
1801	Digvijay (Palej)	1814	Varalaxmi
1802	Hybrid 4 (Vaktapur)	1815	Hybrid 4 (Karnataka)
1803	Hybrid 4 (Jalgaon)	1816	Giza 7
1804	MCU.5 (AP)	1817	AK.277
1805	Badnawar 1	1818	V.797 (Petlad)
1806	Desi—Rajasthan	1819	Gujarat 67 (Anjar)
1807	V.797 (Bavla)	1820	Wagad
1808	Gujarat 67 (Idar)	1821	Pramukh
1809	Hybrid 4 (Navsari)	1822	Jayadhar
1810	MCU.5 (Tirupur)	1823	Gaorani (Latur)
1811	SI. Andrews	1824	Laxmi (Gadag)

STANDARD INDIAN COTTONS

S.C.No.	*Variety*
114	Gaorani 22
115	V.797 (Viramgam)
116	Digvijay (Broach)
117	LSS (Abohar)
118	320F (Abohar)

IV. Extension

This Laboratory has no farm attached to it and no field work is carried out directly under its own charge. All the field work is carried out at various agricultural stations in the States and the samples of the improved cotton strains evolved under different research projects are tested for quality characteristics either at the main Laboratory or at its Regional Stations. This Laboratory does not directly deal with the farmers but indirectly helps them through the State Departments of Agriculture. Further, the Technological Circulars issued on Trade Varieties of Cotton are useful to the growers, the trade and the industry as these circulars indicate the quality of the commercially grown crop.

The Laboratory also renders considerable assistance to those engaged in cotton trade, to other government and civic organisations, etc., by undertaking tests on samples received from these organisations, by imparting training in Cotton Technology and by supplying useful testing instruments.

Testing Work

Apart from the research samples received from various agricultural stations, this Laboratory continued to receive a number of samples of fibre, yarn and cloth for special tests from commercial firms and government and semi-government organisations. Such samples were tested on payment of the prescribed fees. The number of such samples received for various tests during the year 1975, together with the corresponding figures for 1973, 1974 and for the quinquennium 1966-70 are given in Table 19.

TABLE 19 : NUMBER OF SAMPLES RECEIVED FOR PAID TESTS

Type of test	Average for the quinquennium 1966-70	1973	1974	1975
Spinning	14	10	2	27
Fibre (EICA)*	68	123	66	248
Fibre (others)	81	244	92	247
Yarn	109	43	37	27
Cloth	81	46	26	67
Moisture	75	11	76	32
Miscellaneous	21	12	1	1
Total	449	489	300	649

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

The total test fees realised during 1975 for carrying out tests on these samples amounted to Rs. 22,014 against Rs 7,964 during 1974.

Apart from the usual tests of routine nature, the following special investigations were carried out :

1. Three samples of jute bags were received for fabric breaking strength and seam breaking strength. Fabric strength was found to be ranging from 207 kg to 250 kg warp way and from 98 kg to 137 kg weft way. The ranges for side seam and bottom seam strengths were found to be 60 kg to 66 kg and 20 kg to 29 kg, respectively.
2. Two samples of grey cotton fabrics were received for mildew resistance test. In both the cases, the samples showed profuse growth of the test organism indicating that the samples were not effectively protected with anti-mildew chemicals.
3. One sample of kapok was received for testing trash content. It was observed that 100 g of lint sample contained 1.5 g of heavy trash.

The Laboratory is equipped with an electron microscope since 1974. Other organisations have started making use of facility available in the Laboratory and some samples were received for electron microscopic observations as under :

1. Four samples of Terene staple fibre were received for electron microscopic investigation by replica technique. A report on surface topography was given.
2. Three samples (Marked A, B, C,) of H.T. Rayon were received for electron microscopic studies by layer expansion technique. Moist fibres were embedded in a suitable mixture of pre-polymerised polymethacrylate. Ultra thin cross-sections of the fibres after appropriate shadowing were examined in electron microscope. It was observed that the samples A and C, which swell better and had spongy core, might be more pliable as compared to sample B which was more rigid and solid in ultrastructure.
3. Two fabric samples were received for electron microscopic studies. Observations were made: (*i*) by layer expansion technique (cross-section) and (*ii*) by replica technique (surface of fibre). In all eight electron micrographs were supplied.

Six samples were received for light microscopic studies. Samples were examined for the surface characteristics by using pre-polymerised polymethacrylate. The impressions were shadowed by platinum and examined in Projectina. Photographs taken with × 300 magnification were supplied.

Training Facilities

The Laboratory is conducting two training courses, each of two months' duration, for those deputed by cotton trading organisation in Bombay and mofussil centres. During the year, the following students were selected and given training in fibre tests and elements of statistics :

1. Shri Jagdish Hirji Bharmal,
   C/o. M/s. Hirji Bharmal,
   27, Chinch Bunder, Bombay.
2. Shri H. H. Patel,
   C/o. M/s. Manilal Patel and Co.,
   38, Cawasji Patel Street, Fort, Bombay.
3. Shri N. A. Nagda,
   C/o. M/s. Arjan Khimji and Co.,
   28, Mittal Chambers, 2nd floor,
   Nariman Point, Bombay.
4. Shri S. R. Shah,
   C/o. M/s. Mulraj Dayal,
   31, Dr. V. B. Gandhi Marg, Fort, Bombay.
5. Shri Hiran Kalyanji Narsey,
   C/o. M/s. Arjan Khimji and Co.,
   28, Mittal Chambers, 2nd floor,
   Nariman Point, Bombay.
6. Shri S. D. Kathalkar,
   Cotton Classing Centre, opp. Uma Jakat Naka,
   Athwa Lines, Surat.

V. Conferences and Symposia

The Director and/or other Scientists of the Laboratory participated in the following scientific and technological conferences and meetings connected with the work of this Laboratory :

	Meeting	*Place*	*Date & month*	*Names of the officers who attended the meetings/conferences*
1.	Sixteenth Joint Technological Conference of ATIRA	Ahmedabad	27th & 28th Jan., 1975	Dr. S. N. Pandey
2.	National Textile Seminar on "Textile in 80's" at IIT (organised by the Textile Association)	New Delhi	7th & 8th Feb., 1975	Shri B. Srinathan
3.	4th meeting of Sub-committee for Research and Liaison (Physics, Physical Testing & Electronics) of BTRA	Bombay	14th Mar., 1975	Dr. V. Sundaram
4.	Group discussion on "Revised Spinning Productivity Standards & Method of Evaluation" at BTRA	Bombay	15th Mar., 1975	Shri M. S. Parthasarathy & Shri B. Srinathan
5.	First meeting of Sub-committee on Research and Development of Directorate of Cotton Development	Bombay	28th Apr., 1975	Dr. V. Sundaram
6.	Conference of the Directors of ICAR Institutes	New Delhi	28th & 29th May, 1975	Dr. S. M. Betrabet
			30th & 31st May, 1975	Dr. V. Sundaram
7.	Twelfth meeting of the ICDC (Indian Cotton Development Council)	Ootacamand (Tamil Nadu)	10th June, 1975	Dr. V. Sundaram
8.	Techl. Seminar on "Indrarol Crosrol Varga High Production Unit" at Machinery Manufacturers Corporation Limited.	Bombay	4th May, 1975	Shri M. S. Parthasarathy & Shri B. Srinathan
9.	Meeting of the Standing Committee on Cotton of ICMF	Bombay	25th July, 1975	Dr. V. Sundaram
10.	Seminar on "Reflections on Research & Development in Chemical Processing" at BTRA	Bombay	20th Aug., 1975	Dr. S. M. Betrabet, Dr. S. N. Pandey & Kum. I. G. Bhatt

	Meeting	*Place*	*Date & month*	*Names of the officers who attended the meetings/conferences*
11.	32nd All India Textile Conference of the Textile Association (India)	Amritsar	5th & 6th Sept., 1976	Dr. S. N. Pandey
12.	All India Coordinated Cotton Improvement Project Seminar-cum-Workshop on Cotton Improvement Research at College of Agriculture, Nagpur	Nagpur	20th to 23rd Oct., 1975	Dr. V. Sundaram, Dr. S. M. Betrabet, Dr. V. G. Munshi & Shri P. G. Oka
13.	Seminar of Oil Technologists Association at Hindustan Lever Research Centre	Bombay	8th Nov., 1975	Dr. S. N. Pandey
14.	Meeting of the Association of Microbiologists of India at Wilson College	Bombay	22nd Nov., 1975	Shri V. G. Khandeparker

Director also attended :

1. *Six meetings* of the "Expert Committee for classification of Indian cottons" convened by the Textile Commissioner, on *1st July, 5th August, 5th September, 3rd October, 25th November and 4th December, 1975.*
2. *First* and *Second meetings* of the "Expert Committee to consider feasibility of correlating cotton/*kapas* prices with those of yarn and cloth" convened by the Directorate of Cotton Development, on the *18th August* and *25th October, 1975,* respectively.
3. *Second meeting* of the "Expert Committee on cotton varieties and their spinnability" convened by the Textile Commissioner, on the *28th June, 1975.*
4. Meetings of the Governing Council of BTRA on various occasions.
5. Meetings of the Board of Management of VJTI on various occasions.
6. *49th* and *52nd Meetings* of the Executive Council of Mahatma Phule Krishi Veedyapeeth, Rahuri.
7. As Chairman of the Sub-committee on Technology and Engineering, the Director attended *three meetings* convened by the Chairman, Agricultural Scientists Recruitment Board (ASRB) at Delhi, for the preparation of syllabi for various subjects for the competitive examination held by the ASRB. In addition, a number of meetings were held at Bombay with various members of the sub-committee for finalising the syllabi for individual subjects.

Further, the Director and/or other Scientists participated in the meetings of various Sub-committees of Indian Standards Institution on which they happened to be Members/Alternate Members representing ICAR and CTRL.

VI. Summary of the Report

The research activities and testing work progressed satisfactorily as in the past. During the year under review, the Laboratory continued to function as the coordinating centre on Cotton Technology under the All India Coordinated Cotton Improvement Project and to collaborate actively in the research for development of new strains of cotton by evaluating the quality characteristics of the improved cotton strains evolved at various cotton research centres. Apart from the regular testing and evaluation work, various projects in basic research on fibre physics, textile chemistry, ginning and spinning technology, microscopy and microbiology were undertaken. Considerable progress was made in all the research investigations at the Laboratory and a number of research papers were sent for publication. Several new items of equipment and books were purchased by the Laboratory during the year.

During the financial year 1974-75, the actual expenditure was Rs. 22.31 lakhs as against the initial sanctioned grant of Rs. 22.30 lakhs. An expenditure of Rs. 5.36 lakhs was incurred under the Fifth Plan Scheme for modernisation and strengthening of the CTRL for intensive research on cotton against the sanctioned grant of Rs. 5.50 lakhs. Apart from this, a sum of Rs. 0.44 lakh was incurred on the scheme, "Response of Indian cottons to crosslinking treatment with a view to evolve cotton varieties most suitable for chemical finishing treatments", against the sanctioned grant of Rs.0.60 lakh. Further, a sum of Rs. 0.09 lakh was incurred on the scheme, "Studies of spinning from blends of cotton with wool, jute and ramie on cotton system", being carried out in collaboration with CSWRI, Avikanagar (Malpura) and JTRL, Calcutta, against the sanctioned grant of Rs. 0.43 lakh, and a sum of Rs. 0.06 lakh was incurred on the scheme, "Studies on the de-burring of raw wool using mechanical devices", being carried out in collaboration with CSWRI against the sanctioned grant of Rs. 0.29 lakh. The savings in the above three schemes were due to non-filling up of certain posts, consequent on the ban on recruitment of scientific and technical staff.

Research Activities

The progress made in the important research investigations during 1975 is indicated briefly below :

In connection with the All India Coordinated Cotton Improvement Project as well as various projects sponsored by Agricultural Universities, State Governments, etc., for developing new varieties of cotton and improving

cotton production in the country, about 2,192 samples were subjected to tests for determination of fibre quality and spinning performance. As a result of the work carried out during the last few years, several new promising strains have been identified at various breeding research stations.

At the Seventh Workshop Meeting under the All India Coordinated Cotton Improvement Project, which was held on October 22 and 23, 1975, at Nagpur, the following varieties were considered as promising and their release for cultivation was recommended taking into consideration their adaptibility, yield and quality.

Variety	*Area considered to be suitable*
1. *IAN.579-188 (GAU Cot.100 or Vishnu)	Gujarat, Madhya Pradesh and Maharashtra
2. *SRT.1 (GAU.Cot.10)	Gujarat, Madhya Pradesh and Maharashtra
3. AKH.4	Vidarbha tract of Maharashtra
4. DHY.285	
5. *Suvin	Tamil Nadu, Andhra Pradesh, Karnataka and Western Maharashtra.

*These three varieties had been formally released by Shri Jagjivan Ram, Union Minister for Agriculture and Irrigation, on the 29th December, 1974, on the occasion of the Golden Jubilee Celebrations of CTRL.

In addition to above, the following strains were identified as promising ones :

Strain	*State and Institution where developed*
1. RS.235-3	Rajasthan
2. LD.133	Punjab
3. H.655C	Haryana
4. SH.269	(*i*) Haryana Agriculture University (*ii*) IARI, Regional Station, Sirsa
5. ERB.4530	Gujarat
6. ERB.4492	Madhya Pradesh
7. JKHy.1	
8. JD.415	Maharashtra (MPKV, Rahuri)
9. JK.97	Karnataka
10. 1512	Andhra Pradesh
11. CP.15-2	Tamil Nadu (IARI, Regional Station, Coimbatore)
12. CPH.2	

It was also suggested that the popular variety Bikaneri Narma may be purified departmentally and its foundation seed made available for seed multiplication and distribution.

Results of study on response of Indian cottons to crosslinking treatment indicated that some *desi* cottons like Sanjay and Digvijay with their inherent more homogenous structure and circular cross-sectional shape are better suited for crosslinking. Further, among *hirsutum* and *barbadense*, cottons like Deviraj and Sujata, which have high elongation, may prove useful to breeders to evolve cottons better suited for crosslinking.

Study of the effect of crosslinking treatments on the structure, number and distribution of crosslinks is in progress. The results obtained so far indicate that Distention index (DI) decreased as the time of treatment increased in the samples crosslinked both with and without pre-swelling treatment.

Treatment of fibres and yarns with liquid ammonia showed interesting changes in mechanical properties as well as in some structural characteristics.

Methods for determination of cyclopropenoid fatty acid contents were standardised. Cyclopropenoid fatty acid contents were found to be in the range of 2% to 3% in a few samples of crude cottonseed oil and in the range of 0.02% to 1.25% in samples of refined cottonseed oil. It was also observed that the keeping quality of refined cotton oil was inferior to sesame oil and *vanaspati*, but superior to that of safflower oil.

Study on evaluation of protein composition of Indian cottonseeds using Kjeldahl method revealed that protein content values in defatted kernel powder of seven varieties taken up for the study ranged from 45.8% for Suyodhar to 55.0% for Laxmi.

Preliminary experimental work carried out on the utilization of cotton stalks clearly suggests that it would be possible to prepare good quality boards from cotton stalks which may provide a new scope of employment and source of income to cotton growers.

During the study on oxidation and hydrolysis of chemically substituted cotton celluloses, an attempt was made to evaluate the damage to chain in case of benzoylated samples by determining the viscosity of cellulose benzoate of varying degree of substitution using concentrated sulphuric acid as solvent. It was, however, noticed that there was not much difference between the viscosity of cellulose benzoate of the highest degree of substitution, viz. 2.9, and the lowest degree of substitution, viz. 0.32, when dissolved in concentrated sulphuric acid.

Trials of various trashy cottons have shown that the CTRL Kapas Extractor removes finer and bigger impurities present in the seed cotton, without any damage to fibres or seeds, and that its cleaning capacity is sufficient to feed two single-roller gins or one double-roller gin in continuous operation.

The joint report of the survey of the conditions of the cotton ginning factories in the States of Gujarat, Maharashtra and Tamil Nadu, was revised and is being published. The survey revealed that, with a little more care and adequate inducements from the textile industry, it would be possible to bring about appreciable improvements in the ginning of cotton.

Studies on de-burring of raw wool using mechanical device are in progress. The experiments conducted on small scale gave encouraging results in the removal of vegetable impurities without causing any damage to wool hair in the process.

A number of amylolytic organisms were isolated, out of which 14 isolates were found to exhibit good amylase activity. The isolates comprised of six species of *Bacillus*; majority of them belong to *B. macerans*. Among all the isolates studied, *B. subtilis* 159 was the best amylase producer and, hence, further nutritional studies were carried out on this organism.

Although tamarind kernel powder (TKP) is considerably cheaper than starch as a sizing material for cotton warps, the main constraint in wider use of TKP or modified TKP (LTKP) is the difficulty of desizing it later on. It has now been observed that cellulase enzyme of *Penicillium funiculosum* (F_4) is highly effective in removing TKP and LTKP. Another interesting application of cellulase has been found in saccharification of agricultural cellulosic waste materials.

Cellulase enzyme production varies considerably with respect to the substrates, viz., cotton, linters, bagasse, wheat straw pulp, sawdust, etc., used for growing cellulase producing fungus. Electron microscopic studies are in progress to investigate whether the differences in cellulase production could be due to basic structural differences in the cellulosic substrates. Electron microscopic micro-solubility test using cellulase enzyme has been developed to evaluate chemically modified and crosslinked cottons.

Results obtained on native cottons indicated that convolution angle and circularity were highly correlated with spiral angle. On the other hand, the crystallite dispersion angle did not show any such relation with the morphological parameters.

Refractive indices and x-ray orientation factors were determined for seven varieties of cotton, both in their raw state as well as after swelling and stretching treatments in NaOH. It was inferred from the results that differences in orientations among different cottons in the raw state were mainly due to the varying influences of convolutions. The results also showed that the birefringence and x-ray orientation factor increased with stretch up to 5%, signifying an increase in fibrillar orientation.

It has been observed that crosslinking slack mercerized cotton with formaldehyde brings about a drastic reduction in the longitudinal extension modulus. When stretch mercerized cotton was used as control instead of slack mercerised fibres, formaldehyde treatment proved to have little effect on the lateral compression modulus and the longitudinal extension modulus.

From the analysis of the data collected on the strength of attachment of fibre to seeds of varying fuzziness, it appeared that there was no relationship between the strength of attachment of fibre to seed and fuzz index.

Studies on linear density and its influence on fibre tenacity of native cotton fibres have shown that factors, such as cross-sectional shape, stiffness, etc., have practically no effect on the resonance frequency and hence on the results of linear density determined by vibroscopy method. Under 'favourable' agro-climatic conditions, the growth of fibres within the bolls, as measured by the increase in linear density, was very rapid and was complete during the growth period of 30-35 days after flowering. Under adverse conditions, however, the development of cell-wall continued to take place almost up to boll opening.

Studies on the fibre elongation characteristics of different varieties of Indian cottons using Stelometer and Instron Tester indicated that the Stelometer strength and elongation values were practically on par with those determined using Instron. The correlation coefficients between Stelometer and Instron values of strength (0.79) and between Stelometer and Instron values of elongation (0.94) were highly significant.

The Lint Opener fabricated at the Laboratory, was used for opening of some cotton samples and it was found to be as efficient as hand opening in the separation of fibres but very much faster. In the case of very fine varieties, however, some differences were observed in fineness values when the same samples were opened by the two methods.

The work on preparation of nep grades for Indian cottons is in progress and the results are quite encouraging.

Neppiness of the material from raw cotton to yarn was assessed using different methods in the case of twenty-four samples of Standard and Trade Varieties of Indian Cottons, in the coarse and superfine count ranges. The data on these cottons were analysed and relationships between different methods of nep evaluation were worked out.

From an analysis of test results of six samples of Suvin from entomological trials of 1971-72 season, it was observed that only fibre length was affected significantly with *Phosalone*, *Monocrotophos* and *Quinalphos* treatments. It was also noted that treatment with *Phosalone* and *Monocrotophos* gave reduced strength when compared to standard but the change was not very significant.

Studies on blending of cottons have shown that cottons which vary widely in fineness can be blended uniformly. Finer cottons have a tendency to produce neps which can be reduced by blending with coarse cottons.

In connection with the study of blends of cotton and polyester, blending of the new variety of cotton Suvin with 1.2 denier polyester fibre was carried out in the proportions 67 :33, 50:50 and 25:75 polyester-cotton. Testing is in progress.

In connection with the project on spinning from blends of cotton with wool, jute and ramie on cotton system, samples of Shyamali cotton were blended with jute caddies in various proportions and the blended samples were processed using microspinning technique. Further work is in progress.

In the study of quality of material from different stages of processing using four different drafting systems, it was observed that the quality of yarns spun on SKF drafting system was the best and yarns spun on Top-arm drafting systems were found to be superior to those spun on A-500 and 3-roller systems.

It was concluded from the studies on standardisation of Imperfection Indicator that there was considerable variation within and between bobbins in the yarns spun on the 3-roller, A-500 or SKF systems. All the 10 bobbins in a sample had to be tested for determining Uster evenness (U %) and imperfections in terms of thin places, thick places and neps in the yarn.

From the point of view of yarn strength and evenness, the optimum waste level for combing various cottons could be taken as about 12 % to 14 % for Giza 45, 12 % for Sujata and Sudan XG2VS and 16 % to 20 % for Hybrid 4.

The lea CSP of yarn spun on SKF drafting system was higher by about 14 % to 17 % for counts ranging from 30s to 50s compared to yarns spun on A-500 drafting, both using single end feed. Comparing 60s and 80s yarns spun on SKF from single end feed as against double end feed on A-500, the SKF yarns were stronger by about 11 %.

Maximum cleaning efficiency of the blow room was observed for the Blender-SRRL Opener-Shirley Opener-Scutcher combinations, while the cleaning efficiency was the least for the Blender-Airstream Cleaner-Scutcher combination. The total cleaning efficiency of the blow room and card together, however, was not much different between the various combinations.

Study on estimation of rate of fall of CSP at various counts for long and extra-long staple varieties of cotton (about 25 mm) was carried out and regression equations were worked out connecting the average fall in CSP and the average counts in different count ranges.

VII. Personnel

The Agricultural Research Service (ARS) was constituted by the ICAR with effect from the 1st October, 1975. Under the rules framed for the service, scientists in officers' grades will be considered for induction into corresponding S_1, S_2 or S_3 grades in ARS, while all the existing Senior Research Assistants and Research Assistants who possess the minimum qualifications for entry into the ARS are proposed to be considered for induction into grade 'S' of the service in the scale of pay of Rs. 550-900. The Selection Committee of the ASRB and a team of experts in various disciplines visited this Laboratory and held meetings during the period from the 27th to the 29th November, 1975, for screening eligible candidates for induction into the ARS. Pending finalisation of the preliminary induction and selection of candidates for filling up of various posts through a competitive examination to be held in March 1976, the ICAR imposed a ban on the filling up of all vacant posts of Senior Research Assistants and Research Assistants as also the scientific and technical posts in the Junior Class I cadre. However, a few scientific and technical posts which had been advertised earlier were either filled up or the recruitment thereto was approved by the ASRB.

Appointments

The following appointments were made during the year:

Sr. No.	*Name*	*Post*	*Date*
1.	Dr. V. G. Munshi	Senior Testing Technologist	25-6-1975
2.	Shri B. Srinathan	Spinning Technologist	3-7-1975
3.	Dr. S. N. Pandey	Chemist	4-8-1975
4.	Shri G. S. Rajaraman	Statistician	3-9-1975
5.	Dr. K. R. Krishna Iyer ..	Senior Scientific Officer (Physics)	12-9-1975
6.	Kum. Anar S. Dighe	Senior Research Assistant (Microbiology)	7-5-1975
7.	Shri N. S. Gangakhedkar ..	Senior Assistant (Information)	1-7-1975
8.	Shri M. Kunchi Kannan Menon	Electrical Foreman	19-7-1975
9.	Shri C. V. Simon	Research Assistant	5-2-1975

Retirements, Resignations, Transfers and Discontinuation of Services

The undermentioned staff retired or resigned their posts and were relieved from duty on the dates indicated against them:

Sr. No.	*Name*	*Post*	*Date of relief*
1.	Shri S. Ramanathan	Senior Research Assistant (Retired)	30-11-1975
2.	Dr. R. S. Wahi	Senior Research Assistant (Biochemistry) (Resigned)	30-6-1975
3.	Shri K. Jayachandra Rao ..	Research Assistant (Resigned)	28-1-1975
4.	Shri Ram Singh Chauhan ..	- do - - do -	10-3-1975
5.	Shri G. Varadraj Rao	- do - - do -	21-6-1975
6.	Shri I. H. Hunsikatti	- do - (Services terminated)	17-11-1975

The Indian Council of Agricultural Research transferred, in public interest, Shri T. N. Ramamurthy, a deputationist of the Government of Uttar Pradesh and holding charge of a Senior Class I post of Scientist (Fibre Technology) in the Central Sheep and Wool Research Institute, Avikanagar, in the revised scale of pay of Rs. 1100-1600, along with his permanent post, to this Laboratory with effect from 5th December, 1975.

In accordance with a request received from the Punjabrao Krishi Vidyapeeth, Akola, Shri V. B. Suryanarayanan, Research Assistant, in this Laboratory was transferred on deputation for appointment against the post of Senior Research Assistant in the All India Coordinated Cotton Improvement Project, in the Punjabrao Krishi Vidyapeeth at Akola for a period of two years in the first instance with effect from the 21st November, 1975.

VIII. Appendices

APPENDIX I

FINANCIAL STATEMENT

Expenditure and Receipts of the Laboratory During 1974-75

	Sanctioned grant (Rs.)	Actual Expenditure (Rs.)	Savings (—) Deficit (+) (Rs.)
A. EXPENDITURE			
I. Technological Research Laboratory including Regional Stations (non-Plan)			
(*a*) Capital expenditure including expansion of Laboratory	3,25,000·00	3,24,913·00	(—) 87·00
(*b*) Working expenses	19,05,000·00	19,05,969·00	(+) 969·00
	22,30,000·00	22,30,882·00	(+) 882·00
II. Scheme for Modernisation and Strengthening of CTRL for Intensive Research on Cotton (Plan)	5,50,000·00	5,35,727·00	(—) 14,273·00
III. Schemes financed from A.P. Cess Funds :			
Scheme for response of Indian cottons to crosslinking treatments with a view to evolve cotton varieties most suitable for chemical finishing treatments	59,860·00	43,866·00	(—) 15,994·00
Scheme for studies on spinning from blends of cotton with wool, jute and ramie on cotton system (in collaboration with CSWRI and JTRL)	43,432·00	9,434·00	(—) 33,998·00
Scheme for studies on the de-burring of raw wool using mechanical devices (in collaboration with CSWRI)	29,006·00	6,280·00	(—) 22,726·00
B. RECEIPTS			
Analytic and testing fees	13,930·00		
Rent	19,848·00		
Fees for training, application fees, etc. ..	1,490·00		
Sale of publications, etc.	3,376·00		
Interest on loans and advances granted to employees	554·00		
Leave salary and pension contribution ..	2,411·00		
Miscellaneous receipts (including sale of waste cotton)	41,998·00		
	83,507·00		

APPENDIX II

Scientific and Technical Staff Working at the Cotton Technological Research Laboratory as on the 31st December, 1975

Director		Dr. V. Sundaram, M.Sc., Ph.D., A.R.I.C., F.T.I.
Senior Microscopist		Dr. S. M. Betrabet, M.Sc., Ph.D., F.T.I., F.R.M.S.
Senior Physicist		Dr. N. B. Patil, M.Sc., Ph.D.
Senior Spinning Technologist		Shri M. S. Parthasarathy, M.Text. (Bom.), M.Sc. Tech. (Manchester), A.M.C.S.T.
Senior Testing Technologist		Dr. V. G. Munshi, M.Sc., Ph.D., F.T.A.
Chemist		Dr. S. N. Pandey, M.Sc., Ph.D.
Statistician		Shri G. S. Rajaraman, M.A.
Senior Scientific Officer		Dr. K. R. Krishna Iyer, M.Sc., Ph.D.
		(One post vacant)
Scientist (Fibre Technology)		Shri T. N. Ramamurthy, B.Sc. B.Sc. (Tech.)
Scientist (Microbiology)		(Vacant)*
Scientist (Textile Technology)		(Vacant)*
Instrumentation Technologist		(Vacant)
Spinning Technologist		Shri B. Srinathan, B.Sc. (Text.), M.Text. (Bom.)@
Junior Spinning Technologist		(Vacant)
Junior Physicist		Shri P. G. Oka, M.Sc.+
		(Vacant)
		(Vacant)*
Junior Engineer		Shri H. V. Tamhankar, L.M.E., L.E.E.
Junior Microbiologist		Shri V. G. Khandeparkar, M.Sc.
Junior Ginning Technologist		Shri D. G. Shete, L.M.E.
Junior Chemist		Kum. I. G. Bhatt, M.Sc.
		(Vacant)**
Junior Quality Evaluation Officer		Shri L. R. Jambunathan, B.Sc., A.M.I.E.T., L.T.I. (at Surat)
		(Vacant)
		(Vacant)*
Junior Biochemist		(Vacant)*
Junior Microscopist		(Vacant)*
Technical Information Officer		(Vacant)*
Junior Scientific Officer	(*Physics*)	Shri P. K. Chidambareswaran, M.Sc.
- do -	(*Testing*)	Shri A. V. Ukidve, M.Sc.
		(Three posts vacant)
Senior Research Assistant	(*Statistics*)	Shri K. Vankateswaran, B.A.+
		Shri K. Chandran, B.A.
- do -	(*Spinning*)	Shri K. S. Bhyrappa, L.T.T., A.T.A.
		Shri S. Chandrashekar, L.T.M., A.T.A.
		Shri H. R. Laxmivenkatesh, D.T.T.
		Shri A. S. Sathe, B.Text.@
- do -	(*Physics*)	Shri A. W. Shringarpure, B.Sc.
		Dr. (Smt.) P. Bhama Iyer, M.Sc., Ph.D.
		(One post vacant)
- do -	(*Chemistry*)	Smt. Vatsala Iyer, M.Sc.
		Shri M. S. Sitaram, B.Sc.**
		Shri N. Thejappa, B.Sc.+
- do -	(*Instrumentation Foreman*)	Shri G. S. Patel, B.Sc.
- do -	(*Instrument Technician*)	Shri K. M. Paralikar, M.Sc.
- do -	(*Microbiology*)	Kum. A. S. Dighe, M.Sc.
- do -	(*Technical Information*)	Shri M. S. Gangakhedkar, M.Sc., Dip. R.P.
Electrical Foreman		Shri M. K. K. Menon, D.E.E.
Senior Research Assistant	(*Biochemist*)	(Vacant)
- do -	(*Ginning*)	(Vacant)

Senior Research Assistants (Testing)	
Smt. S. B. Pai, B.Sc. (Hons.)	Shri P. K. Jairam, B.Sc.
Smt. K. L. Datar, M.Sc.	Kum. I. K. P. Iyer, B.Sc.
Shri S. R. Ganatra, B.Sc.	Smt. S. D. Pai, B.Sc.
Shri S. G. Nayar, B.Sc., LL.B.	Shri A. K. Gupta, B.Sc. (Hons.)
Shri B. M. Petkar, B.Sc. (Hons.)	Shri G. F. S. Hussain, M.Sc.
Shri K. R. Kamath, B.Sc.	(Nine posts vacant)
Research Assistants (Statistics)	Smt. J. K. Iyer, M.Sc.
	Shri D. V. Mhadgut, M.Sc.
	(One post vacant)
Research Assistant (Spinning)	(Two posts vacant)
- do - *(Workshop)*	(Vacant)
Research Assistants (Testing)	
Smt. J. K. S. Warrier, B.Sc.	Shri E. Kesavan Kutty, B.Sc.
Shri T. K. M. Das, B.Sc.	Smt. P. J. Patankar, B.Sc.
Shri V. Jose Joseph, B.Sc.	Shri R. Srinivasan, B.Sc.
Smt. S. P. Bhatawdekar, M.Sc.	Shri S. G. Gayal, M.Sc.
Shri P. Bhaskar, M.Sc.	Kum A. K. Deshpande, M.Sc.+
Smt. Prema Nair, M.Sc.	Kum. R. Girija, B.Sc. (Hons.)+
Shri C. R. Sthanusubramoni Iyer, B.Sc. ..	Shri S. Aravindanath, M.Sc.
Shri K. V. Ananthakrishnan, B.Sc.	Kum. P. V. Adelkar, B.Sc.
Smt. R. P. Bhat, B.Sc.	Shri R. M. Gurjar, M.Sc.
Kum. S. R. Jage, B.Sc. (Hons.)	Shri S. Sreenivasan, M.Sc.
Shri G. Viswanathan, B.Sc.	Shri R. P. Nachane, M.Sc.
Shri V. B. Suryanarayanan, B.Sc.	Shri D. N. Makwana, M.Sc.
Kum. C. R. Raje, M.Sc.	(Five posts vacant)
Shri B. S. Ganvir, B.Sc.	

Regional Stations

Station	*Senior Research Assistant*	*Research Assistant*
Coimbatore	Shri S. K. Iyer, B.A.	Shri C. P. Venugopalan, B.Sc.
	Smt. Santa V. Nayar, B.Sc.	
Dharwar	Shri E. S. Abraham, B.Sc.	Shri A. J. Shaikh, M.Sc.
		Shri C. V. Simon, M.Sc.
Hissar	Shir S. N. Nagwekar, B.Sc.	(Vacant)*
Indore	Shri W. R. Sharma, B.Sc.	Shri S. B. Jadhav, M.Sc.
Ludhiana		Shri A. K. Ahuja, M.Sc.+
Nanded	Shri A. K. Antony, B.Sc.	Shri K. H. Sawakhande, M.Sc.
		Shri L. D. Deshmukh, M.Sc.+
Nandyal	Shri R. Dwarkanath, B.Sc.	Shri Y. Subrahmanyam, MSc.+
Sriganganagar	Shri Ram Parkash, B.Sc.+	Shri Tula Ram, B.Sc. (Hons.)
Surat		Shri M. C. Bhalod, B.Sc.
		Shri P. V. Varadhrajan, M.Sc.
		Shri P. M. Patil, M.Sc.+
		(One post vacant)+

@ Scheme for studies on spinning from blends of cotton with jute, wool and ramie on cotton system.

\+ Under the All India Coordinated Cotton Improvement Project.

* Under the Fifth Five Year Plan scheme for expansion and strengthening of the Cotton Technological Research Laboratory for intensive research on cotton.

** Under the scheme for response of Indian cottons to crosslinking treatments with a view to evolve cotton varieties most suitable for chemical finishing treatments.

APPENDIX III

Statement Showing Total Number of Employees and the Number of Scheduled Castes and Scheduled Tribes Amongst Them as on 31st December, 1975

Class	Permanent/ Temporary	Total number of employees	Total no. of employees excluding those holding the posts exempted/ do not attract the provision of reservation orders	No. of S.Cs. employees out of Col. 4	Percentage of S.Cs. employees with reference to Col. 4	No. of S.Ts. employees out of Col. 4	Percentage of S.Ts. employees with reference to Col. 4	Remarks
1	2	3	4	5	6	7	8	9
Class I	Permanent 9 Temporary 8	17	—	—	—	—	—	
Class II (Gazetted rank)	Permanent 2 Temporary 2	4	—	—	—	—	—	
Class II (Non-Gazetted rank)	Permanent 26 Temporary 12	38	20	1	3	—	—	
Class III	Permanent 71 Temporary 31	102	102	7	7	1	1	
Class IV	Permanent 46 Temporary 21	67	67	14	21	2	3	

Note: (*i*) The statement is prepared with reference to persons and not with reference to posts. Vacant posts have not been taken into account.

(*ii*) Persons on deputation have been included in the above statement.

(*iii*) Persons permanent in one grade but officiating or holding temporary appointment in the higher grades, have been shown in the figures relating to such higher grade.

APPENDIX IV

Statement Showing the Number of Reserved Vacancies Filled by Members of Scheduled Castes and Scheduled Tribes During the Year 1975

Class of post	Total No. of vacancies					Scheduled Castes				Scheduled Tribes				
	Notified	Filled	No. of posts exempted/do not attract the provision of reservation orders out of Col. 2	No. of posts exempted/do not attract the provision of reservation orders out of Col. 3	No. of vacancies to which reservation applicable	No. of vacancies reserved out of Col. 6	No. of S.C. candidates appointed	No. of S.T. candidates appointed against vacancies reserved for S.C.s in the 3rd year of carry forward	No. of reservation lapsed after carrying forward for three years	No. of vacancies reserved out of Col. 6	No. of S.T. candidates appointed	No. of S.C. candidates appointed against vacancies reserved for S.T.s. in the 3rd year of carry forward	No. of reservations lapsed after carrying forward for three years	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Class I (Rs. 1100-1600 and above)	(A)	5	(B)	(B)	(B)	(B)	—	—	—	—	—	—	—	—
Junior Class I (Rs. 700-1300)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Class II (Gazetted rank)	(A)	2	—	—	(C)	—	—	—	—	—	—	—	—	—
Class II (Non-Gazetted rank)	3	4(D)	—	—	1	—	—	—	—	—	—	—	—	—
Class III	7	6	—	—	1	—	—	—	—	1	(E)	—	—	—
Class IV	6	6(F)	—	—	—	—	3	—	—	—	—	—	—	—

(A) Posts filled by Indian Council of Agricultural Research Headquarters.
(B) All the 5 posts filled were exempted from the reservation orders. In accordance with instructions since received from ICAR in letter No. 7-25/75-Cdn. II, dated the 19th November, 1975, in none of the categories of Agricultural Research Service, there is to be exemption from reservation orders.
(C) These posts were filled by ICAR Headquarters by deputation as per recruitment rules. The posts were those of Accounts Officers.
(D) One post of Senior Stenographer has been filled by promotion as per the recruitment rules.
(E) Action has been taken to fill up the post as per reservation order.
(F) Two posts were filled by ex-servicemen.

IX. Annexures

ANNEXURE I

New Equipments Purchased During 1975

1. Shadograph Balance
2. Curved Crystal Focalizer
3. Stoll Quartermaster Universal Wear Tester
4. Ultrafiltration System
5. Stelometers—Three
6. V.D.F. Torsion Balance
7. Lyophiliser (Freeze Drier)
8. "Tulaman" Semi-self-indicating weighing machine
9. "Tempo" Rotary Film Vacuum Evaporator
10. 'Jebivak' oil sealed High Vacuum Pump
11. Shaker Incubator Bath
12. Comb Sorter (Baer Sorter) with Accessories
13. Flask Shaker
14. "Tempo" Electric Oven—Vacuum Type
15. "Kartik" Air-Compressor
16. Single Roller Gin (Platt type)
17. Hydraulic Ship Jack—capacity 10 tonnes, single acting pump with accessories.

ANNEXURE II

Distinguished Visitors to CTRL During 1975

1. Mr. Dorris D. Brown, 2. Mr. A. Stoneham, 3. Dr. K. R. Anthony.	World Bank Team
4. Shri Nusrat Hasan, Chairman, Cotton Export Corporation of Pakistan, 5. M. Aqil, Commercial Director, Cotton Export Corporation of Pakistan.	Pakistani Delegation
6. Shri R. D. Kittur Minister of State for Regulated Markets, Govt. of Karnataka, Bangalore.	
7. Dr. J. N. Chatterjee, Director, Indian Lac Research Institute, Ranchi.	
8. Shri A. C. Das Gupta, Textile Division, The Delhi Cloth and General Mills Co. Ltd., Delhi.	
9. Dr. A. R. Melville, Chief Natural Resources Adviser, Ministry of Overseas Development, London, U.K.	
10. Dr. Josef Oubrecht, Prof. of Agriculture, University of Prague, Prague, Czechoslovakia.	
11. Dr. Ludvik Hoberlandt, Director, National Museum, Prague, Czechoslovakia.	
12. Dr. Adolf Cejchan, Head, Division of Entomology, National Museum, Prague, Czechoslovakia.	
13. Dr. K. S. Korgaonkar, Cancer Research Institute, Bombay.	
14. Prof. A. N. Kothare, University of Bombay, Bombay.	
15. Dr. Abdul Hafiz, Project Manager, Field Food Production, Food & Agriculture Organization of the United Nations, Near East Region Office, Cairo, Egypt.	

16. Dr. Ing. Kiril Dimev,
Sofia Korovelov-32,
Peoples Republic of Bulgaria.
} Indo-Bulgarian Cultural Exchange Programme

17. Dr. A. A. Avtonomov,
Dy. Director of Tashkent Cotton Selection Institute.

18. B. S. Sanginov,
Director of Tadjic Agricultural Research Institute.

19. Dr. R. Berdymouratov,
Senior Scientist of Cotton Selection,
Turkamanian Research Institute.
} Soviet Delegation of Cotton Experts

20. Shri Falguni K. Sen,
Administrative Staff College of India,
Hyderabad.