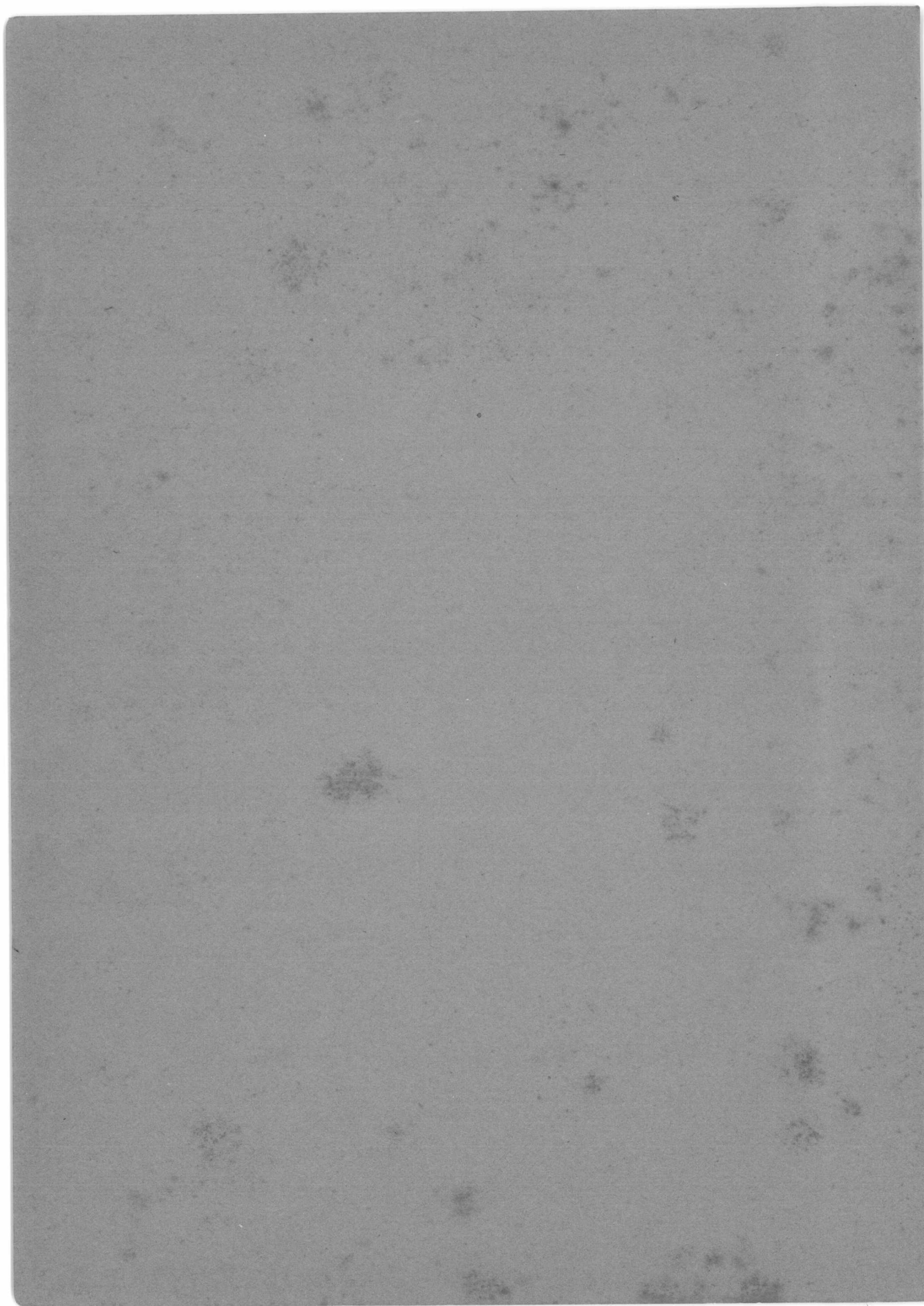


**INDIAN  
CENTRAL COTTON  
COMMITTEE**

**ANNUAL REPORT**  
OF THE  
**DIRECTOR**  
**TECHNOLOGICAL LABORATORY**  
FOR THE  
**YEAR ENDING 31st MAY, 1958.**

**PRICE Rs. 3·00**



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**THIRTY-FOURTH ANNUAL REPORT OF THE DIRECTOR,  
TECHNOLOGICAL LABORATORY, MATUNGA,**

***For The Year Ending 31st May, 1958.***

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This is the Thirty-fourth Annual Report of the Technological Laboratory, and deals with the work done during the year 1957-58. It will be observed from the data presented, that there has been an appreciable improvement all round, outstepping the peak figures recorded last year.

It will be noted from the figures given in Table 1, that the number of samples received for all tests during the year under review was 5,044 as against 3,808 last year showing an increase of as much as 32 per cent. Further, the total number of samples received from the State Departments of Agriculture for full-scale and micro-spinning tests together shows an increase of as much as 36 per cent over that of last year.

The work done on these samples is summarised in Tables 2, 3 and 4, from which it will be seen that during the year under review 2,810 samples were spun, recording an increase of 25 per cent over the corresponding figure for the previous season. That this increase of work was achieved even without working the second shift, which was run for about two months during the previous year, is noteworthy. Further, the Cotton Breeders were provided with the technological data on their samples in time for the next sowing, in accordance with the scheduled programme.

It will be noticed from the figures given in Table 24 that 1,563 samples were received for tests in the Testing House of the Laboratory as against 1,104 of last year thus recording an increase of as much as 42 per cent showing thereby that the trade and industry are increasingly using the facilities available at the Laboratory.

The number of samples tested for fibre properties (Table 25) has increased from 1,786 to 2,047 during the year under report, thus recording an increase of 15 per cent over that of last year.

As regards the research activities of the Laboratory, it may be mentioned that several investigations were completed and papers based on these investigations were either published or sent for publication during the year. Besides, new lines of investigation on samples from agronomic studies and on fibre development have been undertaken. It is proposed to plan out more detailed studies on the latter problem in consultation with the Cotton Breeders. Further, simplified methods for testing fibre maturity and convolutions have been developed, which would help to save the testing time very considerably. Preliminary studies have also been made on characters like fibre-length uniformity and chalazal fibre immaturity in single seeds.

In accordance with the decision of the Indian Central Cotton Committee to meet the urgent demand for space for the work of the Laboratory, the first floor of the Research Laboratory building, which was the residence of the Director, was utilised for housing various sections of the Laboratory. Further, plans for the modernisation of the machinery and equipment and for the necessary additions and alterations to the buildings for this purpose were finalised by the Co-ordinating Committee constituted by the Indian Central Cotton Committee for this purpose. However, the pace of progress of building construction was very slow, and this matter was taken up by the President of the Committee with the authorities of the Central Public Works Department and there has been some improvement in the pace.

The Laboratory had the signal honour of welcoming Shri Ajit Prasad Jain, Minister for Food and Agriculture, Government of India, who evinced keen interest in the working of the Laboratory and favoured with some valuable suggestions for its improvement. It was also fortunate to receive its Founder Director, Dr. A. J. Turner, who went through the work of the Laboratory, expressed his pleasure to see the torch of progress in Cotton Technology burning high and gave some very useful suggestions on future lines of work. Further, the Laboratory was also honoured by being recognised for Post-graduate Research by the Bombay University.

Table 1 gives the number of samples received at the Laboratory for various tests under different heads during the period under review together with the corresponding figures for the previous four years and averages for the three 5-year periods for purposes of comparison.

**TABLE 1**  
Number of Samples received.

Type of Sample	Average			1-6-53 to 31-5-54	1-6-54 to 31-5-55	1-6-55 to 31-5-56	1-6-56 to 31-5-57	1-6-57 to 31-5-58
	1938- 1943	1943- 1948	1948- 1953					
1. Agri. Dept's. Exp. strains.								
Full spg. tests ...	348	372	807	610	652	706	768	905
Micro-spg. tests ...	...	...	...	675	844	1,166	1,092	1,626
2. Standard cottons ...	19	20	17	17	16	24	22	23
3. Technological samples ...	57	267	63	40	46	45	291	251
4. Trade Varieties cottons ...	78	38	37	51	25	50	45	35
5. Spg. tests (paid) ...	...	73	76	65	142	108	66	78
6. Fibre tests (paid) ...	193	261	169	342	231	223	219	330*
7. Fibre tests (Agr.) ...	...	...	128	216	128	298	391	594
8. Yarn tests ...	169	97	190	94	204	383	242	243
9. Cloth tests ...	386	95	105	250	334	573	422	373
10. Samples for valuation ...	34	147	83	25	50	42	9	81
11. Moisture tests ...	...	2	5	6	2	31	186	473
12. Miscellaneous ...	2	8	9	14	9	50	55	32
	1,286	1,380	1,689	2,405	2,683	3,699	3,808	5,044

\* Includes 116 samples from the East India Cotton Association.

It will be seen from the figures given in the above table that the total number of samples received during the period under review is 5,044 as against 3,808 for the previous year, thus recording an increase of as much as 32 per cent. This increase is under the following categories :—(1) Samples sent as the Agricultural Departments experimental strains, (2) Fibre Tests, (3) Samples for valuation and (4) Moisture Tests.

Table 2 gives the number of test reports classified under various categories issued during this period together with the corresponding figures for the previous 4 years and also for the three five-year periods, 1938-43, 1943-48 and 1948-53.

**TABLE 2**  
Number of Reports issued.

Type of Report	Average			1953- 1954	1954- 1955	1955- 1956	1956- 1957	1957- 1958
	1938- 1943	1943- 1948	1948- 1953					
Spinning Test ... ..	131	149	220	246	291	365	397	339
Fibre Test ... ..	43	54	73	93	91	88	115	135
Yarn Test ... ..	99	47	109	54	94	120	95	94
Cloth Test ... ..	316	50	56	139	178	207	269	152
Moisture Test ... ..	...	...	3	5	2	4	17	28
Miscellaneous ... ..	1	2	2	7	6	12	14	7
Total ... ..	590	302	463	544	662	796	907	755

As will be seen from the above table that the total number of Reports issued during the period under review is 755.

The work done during the year under review will be described under the following heads :—

- |  |                      |
|--|----------------------|
| I. Spinning Section (Spinning tests)     | V. Ginning Section   |
| II. Testing House                        | VI. Publications     |
| III. Fibre Testing Section (Fibre Tests) | VII. Summary         |
| IV. Research Work                        | VIII. Miscellaneous. |

### I. SPINNING SECTION

Tables 3 and 4 give the distribution of samples and counts spun at the Laboratory during this period together with the corresponding figures for the previous 4 years and the averages for the three 5-year periods. Consequent on the reorganisation of the States, the data for the different periods are not comparable in some of the States.

TABLE 3  
Number of samples spun.

State	Average			1953- 1954	1954- 1955	1955- 1956	1956- 1957	1957- 1958
	1938- 1943	1943- 1948	1948- 1953					
Bombay ... ..	143	208	429	690	789	929	1,087	1,696
Mysore ... ..	...	...	...	...	...	...	231	180
Madras ... ..	31	24	94	130	144	111	94	119
Uttar Pradesh ... ..	53	28	29	41	68	87	112	113
Madhya Pradesh ... ..	37	30	113	165	292	356	133	213
Punjab ... ..	44*	35	61	83	73	176	150	70
Rajasthan ... ..	...	...	2	70	39	44	20	...
Andhra ... ..	...	...	...	23	64	71	96	97
Miscellaneous ... ..	24	5	18	40	18	78	49	78
Total ... ..	332	330	746	1,242	1,487	1,842	1,972	2,566†
Standard cottons ... ..	19	22	18	16	21	24	22	20
Trade and Tech. tests ... ..	176	233	233	136	240	203	263	224
Grand Total ... ..	527	585	997	1,394	1,748	2,069	2,257	2,810

\* Includes West Punjab.

† 1,840 are micro-spinning samples.

TABLE 4  
Number of yarns spun.

State	Average			1953- 1954	1954- 1955	1955- 1956	1956- 1957	1957- 1958
	1938- 1943	1943- 1948	1948- 1953					
Bombay ... ..	220	329	728	890	1,140	1,258	1,806	2,448
Mysore ... ..	...	...	...	...	...	...	446	318
Madras ... ..	89	67	198	228	254	240	241	217
Uttar Pradesh ... ..	158	83	71	93	120	196	212	224
Punjab ... ..	128*	103	112	147	114	414	298	134
Madhya Pradesh ... ..	21	28	154	266	345	452	251	374
Rajasthan ... ..	...	...	...	...	...	...	60	...
Andhra ... ..	...	...	...	...	...	...	122	119
Miscellaneous ... ..	352	393	443	557	649	1,103	65	120
Total ... ..	968	1,003	1,706	2,181	2,622	3,663	3,501	3,954
Standard tests ... ..	138	152	115	112	144	165	142	130
Trade and Tech. tests ... ..	514	657	753	348	611	593	766	500
Grand Total ... ..	1,620	1,812	2,574	2,641	3,377	4,421	4,409	4,584

\* Includes West Punjab.

Tables 3 and 4 show that the number of samples spun recorded an increase of 25 per cent while the number of counts spun registered a small increase of 4 per cent.

It may be stated here that although these tests were of a routine nature, a few deserve mention as they relate to special experiments; these are given on the preceding pages.



## A. AGRICULTURAL SAMPLES

## BOMBAY STATE

1. *Nine varieties raised in four localities in E. Khandesh, W. Khandesh and Ahmednagar Districts.* It was mentioned in the last report that six varieties, W. 81 (old bulk), W. 81 (Sup. bulk), Y. 1 (old bulk), Y. 1 (Sup. bulk), (7036 C.F. × V) Dh. 2 Sel 1-2-1-2 and control Virnar were tested last year (1956-57) in the three localities, Jalgaon and Chopda in East Khandesh and Dhulia in West Khandesh. In the current season, three more varieties, C. J. 73, (7070 B. 14 × V) 6-8-4 and Virnar New Bulk were added and they were tested in the same three localities and in Shevgaon in Ahmednagar in addition. Analysis of variance applied to the results obtained for mean fibre-length, mean fibre-weight per inch and highest standard counts showed that C. J. 73 was outstanding among them especially in respect of the spinning quality and Y. 1 (Sup. bulk) came next in order. These varieties when raised in Jalgaon and Chopda were significantly longer in staple than when grown at Dhulia and Shevgaon. They gave the best spinning value when raised at Chopda.

2. *280-1 and 394-3 against Kalyan in five centres :* The three varieties, 280-1, 394-3 and Kalyan were tried in five centres, Viramgam, Mandal, Kadi, Bavla and Junagadh in the 1956-57 season. Analysis of variance applied to the results obtained for mean fibre length, mean fibre weight and highest standard counts showed that the three varieties did not differ significantly from one another in any of the three properties. These varieties raised in Junagadh were significantly longer but coarser in staple than when raised at Kadi and Viramgam. These varieties raised at Mandal gave significantly better spinning value than those raised at Viramgam and Junagadh.

3. *Buri strains against Buri 0394 in three centres :* The four Buri strains, 119, 143, 147 and 0296-7 were raised along with the control Buri 0394 in the three centres, Nagpur, Buldana and Yeotmal in the 1956-57 season. Statistical analysis applied to the results of fibre and spinning tests indicated that neither the varieties nor the different centres showed any significant difference in the spinning quality ; but, these varieties raised at Nagpur were coarser in staple than those at Buldana and Yeotmal. Furthermore, 147 was significantly longer in staple than the other varieties. Also, 119 was the finest and 0296-7 was the coarsest among them.

4. *Tests on 134-Co 2 M. from 13 different centres.*—Last year, samples of this cotton of 1955-56 season from 25 different centres in Bombay State were tested and the results were discussed in the last Report. This year, tests were made on samples of 1956-57 season from 13 different centres with a view to assess its variability. The average mean fibre-length was 0.98" (varying from 0.95" to 1.02") recording a decrease of some 4 per cent as compared with the previous year. The average mean fibre-weight per inch was not significantly different from last year and varied from 0.101 to 0.133 × 10<sup>-6</sup> oz./inch. with a mean value of 0.121 × 10<sup>-6</sup> oz./inch. The

average spinning performance was 32s which is 3 counts less than that obtained in the previous year, and the spinning value varied from 28s to 38s standard counts.

5. *Tests on 170-Co 2 from 19 different centres in Gujarat area.*—Similar tests as for 134-Co. 2M were carried out on 170-Co. 2 samples raised in 1956-57 season from 19 centres in Gujarat area. It may be recalled that the results for samples from 14 centres raised in the 1955-56 season were given in the last report. Of these 19 samples, 8 were irrigated, 10 unirrigated, while details about one sample were not known. In general, this variety had maintained its mean fibre-length and spinning quality of the previous season and was 12 per cent finer in staple in the current season; the actual values were mean fibre length of 0.96" (variation from 0.88" to 1.02"), mean fibre weight of  $0.119 \times 10^{-6}$  oz./inch (variation from 0.110 to  $0.133 \times 10^{-6}$  oz./inch), and mean spinning value of 33s (variation from 30s to 38s) standard counts.

6. *Tests on Irrigated 170-Co 2 from 7 different centres in the Deccan Canals Area.*—Similar tests on this cotton as were carried out from the Gujarat area were made from 7 different centres in the Deccan canals area of Bombay State to have a comparative idea of the performance of 170-Co. 2 under irrigated conditions. The average mean fibre-length was 1.02 inch with an average spinning value near about 40s standard counts.

7. *Tests on Karajgaon cotton.*—The local Sub-Committee of the Indian Central Cotton Committee at its meeting held on 23rd September, 1957, recommended that the harsh short staple cotton grown in Karajgaon taluka should be tested at the Laboratory for its various economic characters. Accordingly, a sample was received for tests. The object of these tests is to promote cultivation of this harsh short staple cotton in Karajgaon taluka. The area under Karajgaon Deori cotton was decreasing every year during the last decade. Since the last two years, Karajgaon Deori has been replaced by a *desi* variety much resembling the old type and locally known as Bengali Kata. The sample tested belonged to this type and it had a mean fibre-length of 0.73" with a mean fibre-weight per inch of 0.240 ( $10^{-6}$  oz). It was suitable for spinning upto 9s standard counts.

#### 8. *Agronomic Experiments.*

(i) *Manurial trial on 170-Co. 2 at Surat.*—Five samples of 170-Co. 2, with different manurial treatments, viz., (A) control, (B) 20 lbs. N. 3-4 weeks after sowing, (C) 20 lbs. N. 6-7 weeks after sowing, (D) 20 lbs. N. 3-4 weeks after sowing + 20 lbs. N. 6-7 weeks after sowing and (E) 40 lbs. N. 3-4 weeks after sowing tried in the 1956-57 season at Surat were received for full spinning tests. These treatments did not produce any significant effect on fibre-properties except that the sample with treatment D was significantly longer in staple than the other four samples. The spinning quality also was not significantly different for these samples.

(ii) *Spacing Experiment at Kadiadra*: Two spacings,  $5' \times 2'$  and  $2\frac{1}{2}' \times 2'$  were tried with 8 varieties, B. 2, A. 7, 0394, H. 14, 170-Co. 2-10-1, 1971,  $69 \times 24$  and 134-Co. 2 M. at Kadiadra in the 1956-57 season. Samples from each were subjected to micro-spinning tests. It was found that the closer spacing yielded stronger yarns in the cases of B. 2, A. 7 and 134-Co. 2 M. while the reverse was true for H. 14, 1971 and  $68 \times 24$ . The two spacings did not make any difference in yarn-strength for Buri 0394 and 170-Co. 2-10-1. Fibre length tests carried out on them indicated that wider spacings might give increased fibre-length for Buri 0394, 1971 and 134-Co. 2 M. while the reverse would be the case for 170-Co. 2. The spacings did not show any effect on the other four varieties.

A similar experiment on 7 varieties, A. 7, 170-Co. 2-10-1,  $68 \times 24$ , 134-Co. 2 M, 68-G-3, (E.  $22 \times 1802$ ) F. 9-92 and Digvijay were carried out in the 1957-58 season at Kadiadra. The closer spacing gave stronger yarns for 134-Co. 2 M. as in the case of the previous season, while the reverse was the case for A. 7 and Digvijay. There was no significant difference in yarn-strength between the two spacings,  $5' \times 2'$  and  $2\frac{1}{2}' \times 2'$  in the case of other 4 varieties.

(iii) *Sowing date experiment at Parbhani*.—Micro-spinning tests were carried out on the samples of four varieties, Daulat, Parbhani-American 1, N. 1422 and Co. 4, each of which was raised with 3 sowing dates, A. (20-5-56), B. (5-6-56), and C. (22-6-56) at Parbhani. Treatment C. sown on 22-6-56 is the control which was grown under rain-fed conditions. Treatment A. received 4 irrigations on 18-5-56, 21-5-56, 6-6-56 and 15-6-56 while Treatment B had 3 irrigations on 4-6-56, 7-6-56 and 15-6-56. Thus, A. and B. treatments were pre-monsoon irrigated crops under well-irrigation while C. treatment was sown after break of monsoon and raised without irrigation.

The agricultural details showed that early sown crop in the month of May under irrigation gave very high yields as compared with normal sowing after break of monsoon. The results obtained by long micro-spinning tests showed that yarn-strength was also higher for A. and B. treatments for Daulat as compared with the control C. Treatment A. yielded definitely stronger yarns than the two later sown samples in the case of N. 1422.

A similar experiment carried out in the 1955-56 season which was reported in the last Annual Report showed that the normal sowing (22-6) gave the strongest yarns for Daulat while the reverse was the case in the 1956-57 season.

(iv) *Sowing date Experiments at Badnapur*.—A similar experiment as in the case of Parbhani was also carried out at Badnapur in the 1956-57 season on the four varieties, Parbhani-American 1, Co. 4, 3591 and 1422 with three sowing dates, A. (21-5-56), B. (5-6-56) and C. (30-6-56). Treatment A. received no rainfall before sowing, Treatment B received 0.97" while Treatment C had 4.25" rainfall before sowing. All of them were irrigated four times. It should be noted that though the sowing dates were different, they were all picked on the same days (17-10-56,

from Dhulia in the 1957-58 season in a mill in Bombay. Comparative results of tests are given in Table 5.

**TABLE 5**  
Lea test (lb.) results for 20s yarns spun with 4 T.M.

Variety	1956-57 season				1957-58 season	
	Jalgaon		Dhulia		Dhulia	
	Mill Test	Lab. Test	Mill Test	Lab. Test	Mill Test	Lab. Test
Y 1 ... ..	85.5	86.1	80.4	87.1	78.5	91.3
Virnar ... ..	77.4	84.7	56.9	78.0	68.6	87.7

It may be observed that Y 1 gave stronger yarns than Virnar in all cases both at the mill and at the Laboratory. The difference in strength between the two varieties was greater at the mill than at the Laboratory in all three cases.

(ii) *Pratap and C. J. 73*.—It may be recalled that comparative results for these two varieties raised at Amreli in the 1954-55 and at Sanosara in the 1955-56 season were given in the previous Reports. Mill and Laboratory tests on their samples raised at Damnagar in the 1956-57 season were carried out in a mill at Bombay during this year. All the results are summarised in Table 6.

**TABLE 6**  
Lea test (lb.) results for 20s yarns spun with 4 T.M.

Variety	1954-55 Amreli		1955-56 Sanosara		1956-57 Damnagar	
	Mill Test	Lab. Test	Mill Test	Lab. Test	Mill Test	Lab. Test
Pratap ... ..	73.3	88.7	79.7	80.3	78.2	85.6
C.J. 73 ... ..	77.2	99.5	91.0	92.7	93.7	98.6

It may be noticed that C. J. 73 has given distinctly better yarn-strength than Pratap in all cases both at the mill and at the Laboratory.

(iii) *Deviraj (170-Co 2)*.—Comparative tests were carried out at the mill and at the Laboratory on Deviraj cotton of 1956-57 season raised in Junagadh and in Sarsa (Anand Taluka, Kaira Dt.). The Junagadh sample belonged to the first generation and the Sarsa sample was irrigated. A *kapas* sample weighing 360 lbs. was supplied from Sarsa which was ginned in the Laboratory in double roller gin. It gave a ginning percentage of 35.6 per cent. The lint sample was supplied to a mill at Bombay for mill tests. The Junagadh sample was also tested in the same mill. Comparative results of tests obtained at the mill and at the Laboratory are given in Table 7. The mill had remarked on both the samples that they were very dirty

and full of neps and the mill had to run the counts below normal speeds as the end-breakages were high.

TABLE 7  
Lea test (lb.) results for Deviraj (170-Co 2).

Junagadh				Sarsa - 40s	
Mill Test.		Lab. Test.		Mill Test.	Lab. Test.
30s	40s	30s	40s		
45.4	26.7	51.0	32.8	39.7	41.7

It may be seen that the 40s yarns gave a test of about 40 lbs. at the mill for the Sarsa sample while the Junagadh sample was much inferior to it.

(iv) *Hybrid 60 × 53 in black and light red soils.*—Kapas samples of 68 × 53 (B.C. 68 × Sea Island) grown in black soil at Savera (Sabarkantha District) and in light red (Goradu) soil at Ardi (Kaira District) in the 1956-57 season were supplied to the Laboratory for tests. They were ginned in double roller gin at the Laboratory. Both gave a ginning percentage of 28.6 per cent. Their lint samples were sent to a mill in Bombay for mill tests. They were also tested at the Laboratory. Comparative results of tests are given below in Table 8.

TABLE 8  
Lea test (lb.) results for 40s yarns for 68 × 53.

Mill Test		Laboratory Test	
Black soil	Goradu soil	Black soil	Goradu soil
45.4	47.6	52.3	53.5

The sample grown in light red (Goradu) soil appeared to yield somewhat stronger yarns than that raised on black soil both by the mill test and by the Laboratory test, but this requires further confirmation.

(v) *1494, 1946 and 1422 against Gaorani 6 at Nanded.*—Mill and Laboratory tests were carried out on samples of 1956-57 season of these four varieties. It may be recalled that 1494 and 1422 were tested in the mill previously in the 1954-55 season against Gaorani 6 and the results were reported in the Annual Report for 1956.

Comparative results of these tests obtained in the mill and in the Laboratory for both the seasons are summarised in Table 9.

**TABLE 9**  
Lea test (lb.) results for 30s yarns.

Variety	1954-55		1956-57	
	Mill Test	Lab. Test	Mill Test	Lab. Test
Gaorani 6 ... ..	37.5	46.0	40.6	40.9
1494 ... ..	54.3	54.2	40.5	43.9
1946 ... ..	—	—	36.8	42.2
1422 ... ..	48.7	53.0	38.0	40.5

It may be observed that in the 1954-55 season, both 1494 and 1422 gave definitely stronger yarns than Gaorani 6 when tested both at the mill and at the Laboratory. But, in the 1956-57 season, these two varieties and 1946 did not give better yarn-strength than Gaorani 6.

(vi) *Buri strains at Akola.*—Mill and Laboratory tests were carried out on the samples of Jassids 0394, 0296-7, 0394 and 147, all of them rain-fed and 147 irrigated raised in the 1956-57 season at Akola. Comparative results of tests obtained in the mill at Bombay and at the Laboratory are given in Table 10.

**TABLE 10**  
Lea test (lb.) results for 30s yarns.

Variety	Mill Test	Laboratory Test
Jassids 0394-Rain-fed ... ..	45.5	52.4
0296-7 Rain-fed ... ..	46.8	53.0
0394 Rain-fed ... ..	44.2	50.1
147 Rain-fed ... ..	53.0	54.7
147 Irrigated ... ..	47.5	54.2

It may be observed that No. 147 gave the strongest yarns according to both the mill test and the Laboratory test. In the mill, the rain-fed sample of this variety yielded stronger yarns than its irrigated sample.

(vii) *Desi strains at Akola and Buldana.*—Mill and Laboratory tests were carried out on a sample of 13 A raised at Akola and on samples of B 12 A, Malini (M 5 A) and Virnar raised at Buldana in the 1956-57 season. The comparative results of tests obtained are summarised in Table 11.

TABLE 11

Lea test (lb.) results for 20s yarns.

Variety	Locality	Mill Test	Lab. Test
13 A ... ..	Akola	66.5	71.9
B 12 A ... ..	Buldana	77.1	84.4
Malini (M5A) ... ..	Buldana	83.4	84.7
Virnar (197-3) ... ..	Buldana	83.0	79.4

It may be seen that B 12 A had not indicated any superiority in yarn strength over Malini and Virnar both in the mill test and in the Laboratory test.

## MYSORE STATE

10. *Tests on A 7 and B 2 against Laxmi.*—These three varieties were tried in three centres, Gadag Farm, Ron and Dundur in the two seasons, 1955-56 and 1956-57. The results obtained in the 1955-56 season were given in the previous Annual Report. Analysis of variance applied to the results obtained during both the seasons indicated that these three varieties did not differ significantly from each other either in fibre-properties or in spinning value. But, the main point to note in these results is that they have all got very low fibre-weight per inch in the 1956-57 season. This was due to adverse climatic conditions. The crops were affected to an alarming degree by bad opening of bolls. Furthermore, attack of jassids in the seedling stage and black-arm disease in the growing period affected the crop adversely. It was found that the cottons were full of immature and undeveloped seeds. This year again, the Cotton Breeder, Dharwar has reported that American cottons have been found to suffer from a malady 'Bad opening of bolls'. The extent to which different varieties suffer is different and there is also variation from season to season. It is reported that it was possible to separate the good *kapas* from the bad opened *kapas* during cotton picking.

11. *Sea Island Andrews from Mysore State.*—Full scale spinning tests were carried out on a sample of Sea Island Andrews cotton from Mangalore raised in Paddy Breeding Station in the 1956-57 season. It had a mean fibre-length of 1.32" which was 6 per cent longer than its counterpart at Pattambi while the other fibre properties were similar to those of the Pattambi sample. It was found suitable for spinning upto 80s standard counts of carded yarns, and gave even better yarn-strength results than its Pattambi counter-part.

In the 1957-58 season, 12 samples of Sea Island Andrews made up of one sample each from Mangalore, Yekksar, Skaleshpur, Kumpta, Sagar and Sirsi, 2 samples from Coorg district and four samples from South Kanara district have been received for full spinning tests and tests on them are in progress (*vide* under Kerala and Assam States for further tests on Andrews).

12. *Mill tests on 15-39 X and 16 X against Jayadhar.*—These tests carried out on the 1954-55 and 1955-56 seasons from Dharwar were given in the last Report. They were carried out on the samples of 1956-57 as well. Comparative results of tests at the mill and at the Laboratory for all three seasons are given in Table 12.

TABLE 12

Lea test (lb.) results for 30s yarns

Variety	1954-55		1955-56		1956-57	
	Mill Test	Lab. Test	Mill Test	Lab. Test	Mill Test	Lab. Test
15-39 X ... ..	57.6	62.8	49.5	58.8	41.9	52.3
16 X ... ..	54.4	52.0	50.3	57.6	38.1	52.6
Jayadhar ... ..	57.3	61.5	47.5	55.5	44.6	53.6

It may be seen that out of the 3 seasons, only in one season, 1955-56, both 15-39 X and 16 X have yielded somewhat stronger yarns than Jayadhar both by the mill and the Laboratory tests. In 1956-57, both varieties did not come upto the level of Jayadhar in yarn-strength both by mill test and by Laboratory test.

## MADRAS STATE

13. *Mill tests on improved Varieties*

(i) (a) *9030 and M.C.U.I.*—Mill and Laboratory tests on these two varieties which were carried out in the 1955-56 season raised at Coimbatore were given in the last Report. They were carried out on the samples of 1956-57 season also. Comparative results of tests at the mill and at the Laboratory for both seasons are given in Table 13.

TABLE 13

Lea test (lb.) results for 40s yarns.

Variety	Coimbatore				Kovilpatti	
	1955-56		1956-57		1956-57	
	Mill Test	Lab. Test	Mill Test	Lab. Test	Mill Test	Lab. Test
9030 ... ..	42.9	36.3	45.8	37.9	39.6	40.2
M.C.U. 1 ... ..	39.9	37.0	42.3	34.9	38.1	36.7

It may be seen that 9030 gave stronger yarns than M.C.U.I. in both the seasons in the mill. The lower values of strength obtained in the Laboratory compared to the mill value was due to the fact that the varieties were spun in high draft system in the mill while they were spun in 3 roller system in the Laboratory.



(b) Mill and Laboratory tests were carried out on 9030-8-5 and M.C.U.I. raised in Kovilpatti in the 1956-57 season. Comparative test results obtained are also given in Table 13 above. It may be observed that 9030-8-5 yielded stronger yarns than M.C.U.I. both by the mill test and by the Laboratory test.

#### KERALA STATE

##### 14. *Sea Island — Andrews and Montserrat.*—

(i) *Andrews.*—Test results in the mill and in the Laboratory on the sample of Andrews cotton raised in Kerala State in the 1955-56 and 1956-57 seasons were given in the last Report. In the 1957-58 season, the cotton has spread over different areas in Kerala State and 9 samples from these areas were received for tests. It was observed that the mean fibre-length varied from 1·19" to 1·32" and the fibre-length irregularity percentage varied from 21 per cent to 30 per cent. The variation in mean fibre-weight per inch was small being from 0·115 to 0·132. It is noteworthy that the percentage of mature fibres contained in them was all 70 per cent or above except in one case. The Pressley strength index value also lay in the neighbourhood of 7 except in two cases. The blowroom waste loss ranged from 3½ per cent to 5 per cent only. The yarns obtained from them were slightly neppy or rather neppy. These were all found suitable for spinning about 80s standard carded yarns. About 20 bales of this variety were available in the current season. Arrangements were made by the Laboratory for selling them and they fetched a price of Rs. 2,200/- per candy.

A note on the performance of Sea Island (Andrews) cotton was read at the first All-India-Spinners, Breeders and Ginners Conference held at Bombay in July, 1957.

(ii) *Montserrat.*—A sample of Montserrat raised at the Breeding Station, Pattambi in the 1956-57 season was received for tests. Its *kapas* yield was only 570 lbs. as compared with 1100 lbs. for Andrews cotton per acre. Similarly, its ginning percentage was only 28 per cent as against 31 per cent for Andrews. It was found to be 6 per cent longer and 20 per cent finer in staple than its Andrews counterpart from the same locality. It had also a higher Pressley strength index value. But its fibre-length irregularity percentage was higher and it contained higher percentage of immature fibres than Andrews. It gave definitely better yarn-strength value than its Andrews counterpart from the same locality.

#### ANDHRA PRADESH

15. *Sowing date Experiments.*—Nine varieties, 197-3, Pratap, 3930-A, 3943-B, 4616D2, 6224, 6234, 122 and Cocanadas 2, sown in the months of July, August and September in the 1956-57 season were received for tests from Narasaraopet. July and August sowings were made in the Government Farms, Narasaraopet while the

September sowing was made at the Agricultural Research Station, Lam. The dates of sowing were 9-7-56, 17-8-56 and 19-9-56. Accumulated rainfall upto sowing from April was 14.02", 19.39" and 25.57" respectively for the July, August and September sowings. The rainfall during crop growth was 20.74", 22.13" and 12.37" respectively. The picking periods were from 13-11-56 to 29-12-56 (first flush) and 13-3-57 to 3-4-57 (second flush) for July sowing, 5-4-57 to 8-5-57 for August sowing and 20-4-57 to 15-5-57 for September sowing. Micro-spinning tests were carried out on these samples and analysis of variance applied to the results indicated that the differences in yarn strength between the three sowings were non-significant.

## MADHYA PRADESH

## 16. Mill Tests.—

(i) *Maljari*.—These tests carried out on samples of the two seasons, 1954-55 and 1955-56, raised at Khargone were given in the 1956 Report. They were carried out on two samples of 1956-57 season as well. Comparative results of tests obtained at the mill and at the Laboratory for all three seasons are given in Table 14.

TABLE 14  
Lea test (lb.) results for 20s yarns.

Variety	Season	Mill Test	Lab. Test
Maljari Exp. Farm ... ..	1954-55	77.0	81.5
Maljari Cultivator ... ..	1954-55	68.9	69.2
Maljari Exp. Farm ... ..	1955-56	60.5	72.5
Maljari Stage I ... ..	1956-57	69.0	75.0
Maljari Stage II ... ..	1956-57	65.5	69.8

The cultivator's sample gave a lower yarn strength than the Farm sample both at the mill and at the Laboratory in the 1954-55 season and the stage I sample yielded better yarn-strength, than the stage II sample in the 1956-57 season.

(ii) *A 51-9 against Buri 0394*.—Mill and Laboratory tests were carried out on the samples of these two varieties raised at Khargone in the 1956-57 season. Comparative results of tests obtained for them are given in Table 15.

TABLE 15  
Lea test (lb.) results for 30s yarns.

Variety	Mill Test	Laboratory Test
A51-9 ... ..	53.2	52.7
Buri 0394 ... ..	45.2	44.9

It may be seen that A 51-9 gave definitely stronger yarns than Buri 0394 both at the mill and at the Laboratory.

(iii) *C.T.I. 4-21 against Indore 2.*—Mill and Laboratory tests were carried out on the samples of these two varieties raised at Badnavar in the 1956-57 season. Comparative results of tests obtained for them are given in Table 16. C.T.I. 4-21 is derived by crossing Surat derivate of (Co 2 × tomentosum) with the local hirsutum, Indore 2.

TABLE 16  
Lea test (lb.) results for 30s yarns.

Variety	Mill Test	Laboratory Test
C.T.I. 4-21 ... ..	57·3	56·7
Indore 2 ... ..	47·8	45·0

It is noteworthy that C. T. I. 4-21 yielded definitely better yarn-strength than Indore 2 both by the mill test and the Laboratory test.

#### UTTAR PRADESH

17. *Sowing date experiments at Bulandshahr.*—The five varieties, H 14, 9995, 216F, M4 and 320F were sown on two different dates, 29-4-57 and 31-5-57 with a difference of more than a month. But the pickings were made on the same dates 30-9-57 to 11-11-57 for both sowings. A similar experiment on the first four varieties mentioned above were carried out last year, the results of which were given in the last Report. The lea strength results obtained by micro-spinning technique for both the seasons showed that, in both the seasons, the April sown samples yielded stronger yarns than the respective May sown samples except in the case of 216 F for which the May sown sample gave stronger yarns in 1956 season than the April sown sample while both sowings gave about the same lea strength in the 1957 season.

#### 18. *Mill Tests.*—

(i) *35/1 from four centres.*—Mill tests on 35/1 from four different centres, Auraiya, Kasganj, Muzaffarnagar and Mainpuri in the 1956-57 season were carried out in a mill at Kanpur. Samples of this cotton from these centres were also tested at the Laboratory. Similar tests on 35/1 from the three centres, Muzaffarnagar, Hapur and Rampur carried out in the same mill in the 1955-56 season are also available. Comparative results of tests at the mill and at the Laboratory are summarised in Table 17 for both seasons.

TABLE 17

Lea test (lb.) results for 10s yarns.

	1955-56		1956-57	
	Mill Test	Lab. Test	Mill Test	Lab. Test
Auraiya ... ..	—	—	80·6	111·0
Kasganj ... ..	—	—	72·5	66·6
Muzaffarnagar ... ..	53·9	107·6	97·5	—
Mainpuri ... ..	—	—	101·0	—
Hapur ... ..	67·2	100·3	—	—
Rampur ... ..	57·9	80·5	—	—

It may be seen that Laboratory test results were not available for 10s yarns for the Muzaffarnagar and Mainpuri samples of 1956-57 season. These two samples gave better test results at the mill than the Auraiya and Kasganj samples in the 1956-57 season.

(ii) 216 F.—Mill tests on this variety from four different centres, Auraiya, Kasganj, Aligarh and Mainpuri of the 1956-57 season were carried out in a mill at Kanpur. Similar tests were carried out in the same mill in 1954-55 season also from four centres, Aligarh, Khurja, Mathura and Dibai. They were given in the 1956 Report. A sample of this cotton from Aligarh in the 1955-56 season was also tested in the same mill. These test results were given in the 1957 Report. A consolidated summary of all results on this variety for mill and Laboratory tests is given in Table 18.

TABLE 18

Lea test (lb.) results for 30s yarns for 216 F.

	1954-55		1955-56		1956-57	
	Mill Test	Lab. Test	Mill Test	Lab. Test	Mill Test	Lab. Test
Auraiya ... ..	—	—	—	—	38·3	51·7
Kasganj ... ..	—	—	—	—	36·0	47·6
Aligarh ... ..	43·9	46·9	40·5	48·1	47·8	50·9
Mainpuri ... ..	—	—	—	—	37·2	53·4
Khurja ... ..	46·6	51·3	—	—	—	—
Mathura ... ..	43·5	51·4	—	—	—	—
Dibai ... ..	46·8	52·8	—	—	—	—

The differences were small when this variety was grown in different centres according to Laboratory tests.

(iii) 320 F.—Mill tests on this variety from the three different centres, Auraiya, Kasganj and Meerut of the 1956-57 season were carried out in a mill at Kanpur. Similar tests were also carried out on the Badaun sample of 1955-56 season in the same mill. Comparative results of tests obtained in the mill and in the Laboratory are given in Table 19.

TABLE 19

Lea test (lb.) results for 320 F. cotton

	1955-56 — 30s yarns		1956-57 — 20s yarns	
	Mill Test	Lab. Test	Mill Test	Lab. Test
Badaun ... ..	45.7	51.7	—	—
Auraiya ... ..	—	—	56.1	99.3
Kasganj ... ..	—	—	55.9	87.8
Meerut ... ..	—	—	51.3	—

It may be seen that the mill test results are very poor as compared with the Laboratory results in the 1956-57 season. The samples from Auraiya and Kasganj seem to be better than that from Meerut according to the mill test results.

## PUNJAB STATE

19. *Mill Tests.*—

(i) *320 F and L.S.S.*—Mention was made in the previous Reports that arrangements had been made for mill tests to be carried out on all trade varieties of Indian cottons. Accordingly they were made on the two varieties, 320 F and L.S.S., of 1956-57 season in a mill in Bombay. Comparative results of tests obtained at the mill and at the Laboratory are given in Table 20.

TABLE 20

Lea test (lb.) results for 320 F. and L.S.S.

Variety	Counts	Mill Test	Laboratory Test
320 F ... ..	32s	43.9	37.8
L.S.S. ... ..	24s	62.7	59.2

(ii) *H 14.*—It was decided at the meeting of the Indian Central Cotton Committee held in July 1957 that mill tests should be carried out on H. 14 Cotton. Accordingly, one bale each of H 14 (Hansi) and H 14 (Karnal) of 1957 season was supplied to the mills and corresponding lint samples supplied to the Laboratory by the Cotton Breeder, Hansi. The Breeder reported that there was very inclement weather and unprecedented attack of pink bollworm resulting in premature opening of bolls, discolouration, production of high percentage of yellow and diseased *kapas* and reduction of yield to one third the normal. He also stated that the samples constituted all pickings but efforts were made to remove diseased and

yellow kapas as far as possible before ginning as was normally being done in the ginneries. Such a sample should not have been sent for the mill test.

Comparative mill and Laboratory test results are summarised in Table 21.

TABLE 21  
Lea test (lb.) results for H. 14.

	H. 14 (Hansi)		H. 14 (Karnal)	
	Mill Test	Laboratory Test	Mill Test	Laboratory Test
Strength (lb.) corrected to nominal 18s	74.2	99.6	77.9	106.4

It may be observed that the Karnal sample gave better yarn-strength both at the mill and at the Laboratory. The Laboratory test results are appreciably higher than those obtained in the mill.

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20. *Tests on Hirsutum (indigenous and exotic).*—19 samples of selections, 7 of them indigenous, 4 from exotic varieties obtained recently from the U.S.A. and the other 8 from exotic varieties obtained from the U.S.S.R. grown in the Division of Botany, Indian Agricultural Research Institute, New Delhi in 1956-57 season were received for tests. Fibre tests and micro-spinning tests were carried out on them. The latter tests could not be carried out on 4 of them as their lint samples were too small in weight. It was found that some of the indigenous material was as long and fine as those obtained from abroad. All of them were also fully mature. The micro-spinning test results for 40s counts indicated that E.C. 9227 from the U.S.S.R. yielded the strongest yarns among them, the indigenous variety 56/S-2 came next while E.C. 9230 (U.S.S.R.) and 56/S-7 (Indigenous) took the third place in respect of yarn-strength.

#### GENERAL

21. *Tests on improved varieties grown from distributed seed at various stages of multiplications.*—In accordance with the decision of the Indian Central Cotton Committee in 1950, tests are being conducted year by year at the Laboratory on improved varieties from distributed seed at various stages of multiplication. These tests were commenced from 1950-51 season. The results obtained for the six seasons from 1950-51 to 1955-56 for the improved standard cottons were written up in the form of a paper (by R. L. N. Iyengar and V. Venkataraman) and read before the All-India Cotton Spinners', Breeders' and Ginners' Conference held in July 1957 at Bombay. It was observed in this paper that though there was no regular trend of a fall in quality with the advancing stage, there was a significant fall in the later

stages as compared with the earlier ones. It was also observed that the quality would not suffer so long as there was departmental vigilance but deterioration might set in later when the departmental vigilance was withdrawn. Greater vigilance, such as better seed distribution practices and supervision at the ginneries, might help to lessen the drop in quality to some extent.

**TABLE 22**  
**Highest Standard Counts, 1956-57 season.**  
*Improved varieties in various stages of multiplication*

Serial No.	Improved variety	Place grown	Stage					
			1	2	3	4	5	6
1	<b>I. Bombay State</b>							
	Virnar	Jalgaon	...	24	26	26	...	...
	"	Dhulia	...	25	24	21	...	...
	"	Yawal	...	...	25	25	...	...
2	"	Amalner	...	...	25	23	...	...
	Digvijay	Haldar	...	41	...	...	...	...
	"	Itola	...	...	36	...	...	...
3	"	Ram-Pipri	...	...	39	...	...	...
	Kalyan	Bavla (a)	...	27	28	26	...	...
	"	" (b)	...	27	28	27	...	...
	"	Kadi (a)	...	26	26	27	...	...
	"	" (b)	...	24	25	27	...	...
	"	Viramgam	...	28	28	27	...	...
	"	Mandal	...	28	25	24	...	...
4	"	Junagadh	...	26	24	...	...	...
	Vijalpa	Surat	...	31	...	...	...	...
	"	Pungam	...	30	...	...	...	...
	"	Athuwa	...	...	34	30	...	...
	"	Vijalpur	...	...	28	34	...	...
	"	Bardoli	...	...	30	29	...	...
5	"	Olpad	...	...	32	31	...	...
	"	Jagadia	...	...	...	30	...	...
6	Daulat	Parbhani	...	25	25	26	...	...
6	1422	Latur	...	...	28	28	...	...
7	<b>II. Mysore State</b>							
	Laxmi	Gadag	...	...	39	39	38	39
8	"	Muddebihal	...	...	...	...	34	34
	Jayadhar	Dharwar	...	...	34	35	33	33
	"	Bagalkote	...	...	...	29	24	25
	"	Bijapur (a)	...	...	...	23	20	20
	"	" (b)	...	...	...	...	33	25
	"	Annigiri	...	...	...	...	30	...
	"	Bailhongal	...	...	...	...	30	...
	"	Haveri	...	...	...	...	33	34
9	"	Hubli (a)	...	...	...	...	36	34
	"	" (b)	...	...	...	31	30	28
9	<b>III. Madras State</b>							
	K 2	Kadambur	...	...	...	22	28	23
	"	Kovilpatti	...	...	...	...	28	28
	K 5	Palladam	...	...	...	...	39	38
11	M. C. U. 1	Tiruppur	...	...	...	43	43	
12	M. C. U. 2	Srivilliputhur	...	...	...	...	47	
13	<b>IV. Rajasthan State</b>							
	C Indore 1	Kapasin	...	30	28	...	...	...
14	<b>V. Punjab State</b>							
	320 F	Abohar	...	30	30	32	...	...

Fourteen improved varieties belonging to different stages each received from different centres were tested in the 1956-57 season. These varieties were Virnar, Digvijay, Kalyan, Vijalpa, Daulat and 1422 from Bombay State, Laxmi and Jayadhar from Mysore State, K2, K5, M.C.U. 1., and M.C.U. 2 from Madras State, C. Indore 1 from Rajasthan and 320 F from Punjab. The highest standard counts obtained for the different stages of these varieties in this season are given in Table 22. It may be seen from this Table that no general decline was observed in spinning quality as the stage of multiplication advanced, thus confirming the previous finding. There are, however, a few exceptions viz., Virnar at Dhulia, Kalyan at Mandal, Vijalpa at Athwa, Jayadhar at Bagalkote, K 2 at Kadambur, M.C.U. 1 at Tiruppur and M.C.U. 2 at Srivilliputhur. These have recorded a decline at the later stages or at least at the latest stage of multiplication for which results are available.

22. *Mill and Laboratory Tests on Improved varieties and Trade varieties of Indian cottons.*—A number of improved varieties and trade varieties had been subjected to mill and Laboratory tests each year. It was, therefore, thought that all the available results should be consolidated in order to arrive at some idea of the average variation in each test. A paper entitled 'Comparative mill and Laboratory tests on improved varieties and trade varieties of Indian cottons' discussing these results was presented by R. L. N. Iyenger and V. Venkataraman at the 8th Conference on Cotton Growing Problems in India, held at Coimbatore in December, 1957. It was found from the results available for 49 varieties for 20s yarns that the Laboratory test was, on the average about  $11.8 \pm 1.0$  lb. or 14 per cent higher than the mill test. Similarly, from the results available for 57 varieties for 30s yarns, the Laboratory test was, on the average,  $3.9 \pm 0.6$  lbs. or 7 per cent higher than the mill test.

Comparative mill and Laboratory tests carried out subsequently during the period have all been discussed above under each State separately.

23. *Results for Extra-long staple (1-1/16" and above) cottons of 1956-57 season tested from different States.*—It was suggested that the results of full-scale and micro-spinning tests of the extra-long staple material developed in various States under different schemes of the Indian Central Cotton Committee might be given in the Annual Report of the Laboratory in view of the urgency of developing those strains in the country. This would help the Breeders to draw upon the material for use in their Breeding Programme. Accordingly, the available results for such cottons tested in the 1956-57 season at the Laboratory are given in Table 23.

#### B. STANDARD INDIAN COTTONS

The Laboratory publishes two bulletins annually, one on the results of the standard cottons and the other on trade varieties. Standard cottons are grown on the Government Farms while the trade varieties are drawn from the commercial bales received in the local market. The samples of standard cottons represent,



TABLE 23

Results for Extra-long staple cottons ( $1\frac{1}{8}$ " and above) tested for 1956-57 season.

Serial No.	Variety	Place	Mean-fibre length (in)	Mean-fibre weight per inch ( $10^{-6}$ oz.)	H. S. Counts
<b>Bombay State (Inter-specific hybrids) :</b>					
1	68 × 22-5-E-2 ...	Surat ... ..	1.09	0.126	28
2	68 × 22-5-1176 ...	" ... ..	1.11	0.124	32
3	68-G-3 ...	" ... ..	1.10	0.152	37
4	68-18 ...	" ... ..	1.10	0.134	33
5	134-Co 2 M-21 ...	" ... ..	1.18	0.113	38
6	134-Co 2 260 ...	" ... ..	1.18	0.118	34
7	I.S.C. 67 ...	" ... ..	1.16	0.106	36
8	68-G-4 ...	" ... ..	1.08	0.109	32
9	134-Co 2 M-46 ...	" ... ..	1.15	0.111	33
10	134-Co 2-335 ...	" ... ..	1.14	0.109	38
11	68-1146 ...	" ... ..	1.06	0.106	29
12	134-Co 2 M (Nucleus) ...	" ... ..	1.13	0.133	39
13	B. C. 68 × Sea Island ...	Kapadvanj (Kaira) ...	1.20	0.091	60
14	" (Black soil) ...	Savera (Sambarkantha)	1.18	0.087	...
15	" (Goradu soil) ...	Ardi (Kaira) ... ..	1.18	0.088	...
<b>Mysore State</b>					
16	M. A. 5 × Tide after 19-1	Mandya ... ..	1.07	0.111	33
17	Sea Island (Andrews) ...	Mangalore ... ..	1.32	0.119	80
<b>Kerala State</b>					
18	Sea Island (Andrews) ...	Pooled sample ...	1.24	0.128	60
<b>Madras State</b>					
19	Lo 299 ...	Srivilliputhur ... ..	1.08	0.123	50
20	Lo 315 ...	" ... ..	1.08	0.126	51
21	Lo 318 ...	" ... ..	1.08	0.128	48
22	Lo 509 ...	" ... ..	1.12	0.124	40
23	Lo 523 ...	" ... ..	1.10	0.109	48
24	0484-A 1 ...	" ... ..	1.06	0.111	54
<b>Punjab State</b>					
25	A.C. 83 ...	Hansi ... ..	1.10	0.153	32
26	68 F ...	" ... ..	1.11	0.162	36
27	A. C. 88 ...	" ... ..	1.08	0.150	37
28	A. C. 95 ...	" ... ..	1.08	0.138	37
29	L. L. 50 ...	Abohar ... ..	1.12	0.143	37
30	L. L. 56 ...	" ... ..	1.07	0.143	47
31	L. L. 57 ...	" ... ..	1.08	0.133	49
32	L. L. 79 ...	" ... ..	1.07	0.131	51
33	L. L. 80 ...	" ... ..	1.07	0.127	50

so to say, an ideal which can be attained under optimum conditions of cultivation while those of trade varieties represent the actual state of affairs in the ordinary fields.

The performances of standard cottons which were being tested in the Laboratory since its inception for the last 33 years and more were examined in order to see whether these varieties which were grown on Government Farms, had maintained their quality or had shown signs of deterioration. The results for fibre-length, fibre-weight and highest standard counts were tabulated and analysed. Only four varieties, Surat 1027 A. L. F., Nandyal 14, Cambodia Co 2 and Westerns H 1 had remained as standard cottons for over 30 years while others had been replaced by better varieties. It was found that there had been no trend of general fall in fibre-properties or in spinning quality in any of the varieties inspite of such a long period of years for which they were cultivated, which reflected the soundness of the cotton breeding methods employed in India. These results were written up in the form of a paper entitled 'whether the standard cottons have deteriorated in quality' and read at the All-India Cotton Spinners', Breeders' and Ginners' Conference held at Bombay in July, 1957.

As in the past, extensive fibre and spinning tests were carried out on the standard Indian cottons of the 1956-57 season which covered as much as 52 per cent of the total area under cotton cultivation in the Indian Union. It was estimated that growing of these improved varieties in place of the previous local varieties had benefitted the farmers by an additional income of as much as 22.1 crores of rupees in the 1956-57 season alone. A technological bulletin (No. 95) embodying the results obtained for these varieties was published during the period under review. Attention is drawn to the following few points in the bulletin.

(i) Digvijay cotton was added to the list.

(ii) In the 1956-57 season, the three varieties, M.C.U. 1 (winter) and Karunganni 5 from Madras State and Parbhani—American 1 from Andhra Pradesh had recorded an improvement in spinning value over the previous season. Of the remaining 18 varieties, 11 of them had maintained their performances while the other 7 varieties, Vijalpa, Buri 0394 and Gaorani 6 from Bombay State, Laxmi and Westerns 1 from Mysore State, M.C.U. 2 (summer) from Madras State and Nandyal 14 from Andhra Pradesh had registered a decline in spinning value.

The following standard cottons of the 1957-58 season have been received for tests during the period under review and tests on them are in progress.

- |                   |                         |                         |
|-------------------|-------------------------|-------------------------|
| 1. Virnar.        | 5. Gaorani 12.          | 8. Buri 0394.           |
| 2. Jarila.        | 6. Parbhani-American 1. | 9. Gaorani 6.           |
| 3. P. A. L. S. S. | 7. H. 420.              | 10. Vijalpa             |
| 4. P. A. 320 F.   |                         | 11. Surat 1027 A. L. F. |

### C. TRADE VARIETIES

As in the case of the Standard Indian Cottons mentioned above, the results for two sets of samples (standard and trade variety) for the 5 seasons, 1951-56,

TABLE 24

Number of samples tested in the Testing House.

Nature of Test	Average of samples received								
	1938-43	1943-48	1948-53	1953-58	1953-54	1954-55	1955-56	1956-57	1957-58
Spinning Tests ...	38	75	68	89	57	130	105	75	76
Fibre Tests ...	51	144	110	161	177	125	137	124	240
Yarn Tests ...	168	97	188	233	94	204	383	242	243
Cloth Tests ...	386	95	115	390	250	334	573	422	373
Moisture Tests ...	5	2	5	168	6	2	31	186	615
Miscellaneous Tests	2	7	6	29	14	10	50	55	16
Total ...	650	420	492	1,070	598	805	1,279	1,104	1,563

It is gratifying to note that various commercial and Government organisations are continuing to take advantage of the facilities offered by the Testing House for getting authoritative and technical reports on many items. Some of these organisations are listed below :—

1. Merchants.
2. Mills.
3. Manufacturing Concerns.
4. State Government Departments.
5. Central Government Departments.
6. Bombay State Road Transport Corporation.
7. Surveyors.
8. Indian Standards Institution, etc., etc.

Generally most of the samples tested were of a routine nature, but a few worthy of special mention, are given below :—

1. A hank of yarn dyed in deep red and stated to be damaged at certain places was received for study of the cause of tendering. The cause of tendering appeared to be due to the fall of some drops of mineral acid or an oxidising solution.

2. Four samples were received from a commercial firm in grey and dhobi washed states for determining the effect of their processing and treatment. They were tested for wear and tear tests. The wear resistance of the treated cloth showed significant increase as compared to the controls.

3. Two grey cloth pieces treated chemically, with silicon fluoride and antiseptic eramine D, against mildew attack, were sent for authoritative report on the effectiveness of the respective treatments. They were tested for microbial attack and the results were duly reported.

4. A samples of dhoti border of blue colour and dhoti piece as well as of a sample of dhoti with green border and a small piece of dhoti with border portion missing were received from Police Department in connection with criminal investigation for identification and general report on cloth. The samples were tested and a report issued.

The total number of samples tested since the inception of the Testing House is 13,331, the average per annum being 605.

The fees for the tests for the period under review for the various reports issued amounts to Rs. 25,250/- as against a sum of Rs. 22,650/- received during the previous year.

### III. FIBRE TESTS

Samples on which fibre tests were done by the Fibre Testing Section fall under the following categories :—

- (i) Samples received from the Government Agricultural Farms,
- (ii) Standard Indian cottons, on which more elaborate tests than all other types of samples are done.
- (iii) Commercial samples received from mills, trade organisations, East India Cotton Association, etc.
- (iv) Samples connected with ginning, technological and other investigations, undertaken at the Laboratory, and
- (v) Miscellaneous.

The number of samples tested for fibre properties under different categories in the current year together with the corresponding figures for the previous four years and average for the period 1946-48 and 5-year period 1948-53 for purposes of comparison are given in Table 25, which shows that during the period under review, fibre tests were made on 2,047 samples recording an increase of 15 per cent as compared with last year.

**TABLE 25**  
Number of samples tested in the Fibre Testing Section.

	Average		1953-54	1954-55	1955-56	1956-57	1957-58
	1946-48	1948-53					
Standard ... ..	20	17	20	17	21	21	30
Agricultural (spun) ... ..	446	475	430	565	958	794	759
Agr. (for fibre tests only) ... ..	116	190	173	344	374	610	736
Commercial ... ..	182	197	351	293	253	271	409*
Ginning ... ..	137	64	56	42	17	88	49
Technological ... ..	98	58	220	46	30	2	64
Miscellaneous ... ..	13	27	59	58	...	...	...
<b>Total ...</b>	<b>1012</b>	<b>1028</b>	<b>1309</b>	<b>1365</b>	<b>1653</b>	<b>1786</b>	<b>2047</b>

\*118 samples received from the East India Cotton Association.

Most of the tests carried out on small size samples were of a routine nature, but a few of them deserving mention are given below :—

1. *Sea Island Andrews.*

(a) *Sample from Kerala State.*—Results for large-size samples of Sea Island Andrews were discussed before under the Item 'Agricultural Samples'. A small sample of kapas of this cotton raised at Thiruvegapura in Kerala State was received for fibre tests. The crop was irrigated twice after sowing during the drought period. Thus, it was raised under protected irrigation. The area sown was 4.35 acres of which 0.65 acres only were given protected irrigation. The yield of kapas per acre for the rain-fed crop was 380 lbs. while it was 778 lbs. for the irrigated crop. This sample compared quite favourably with the other samples of Andrews tested from 9 different centres in Kerala in the current season in respect of mean fibre-length and maturity. But, it was coarser and had higher Pressley strength index value than these nine samples.

(b) *Sample from Assam.*—A half pound sample of kapas of Sea Island Andrews was received for tests from the District Agricultural Officer, United Mikir and N. C. Hills, Diphu (Assam) under instructions from the Sea Island Cotton Development Officer. This Officer reported that the bolls did not burst fully due to severe drought and most of the plants died off before forming full bolls. He further stated that the prospect of the crop was not satisfactory. Fibre test results carried out on the sample showed that the percentage mature fibres were low, being 46 per cent, probably due to the effect of drought.

2. *Two samples from Dhadesugur.*—Two kapas samples, Raichur Barbadense Perennial D/24 and 1821-1-1XRB, F 1 hybrid were supplied by the Programme Administration Advisor, Planning Commission. They were obtained from Tungabhadra Agricultural Research Station, Dhadesugur. They had a fairly high ginning percentage of about 36 per cent, a mean fibre-length of an inch and normal fibre-strength with a Pressley index value of more than 7. They were, however, only fairly mature. The F 1 hybrid was somewhat longer and 30 per cent finer in staple than the Perennial. It was estimated that the hybrid (46s) might spin about 8 counts finer than the Perennial (38s).

3. *Samples of Chinese Origin.*—Five samples, Chin Yu 5, Liao Young, Kiangpu, Chin-Chou Dehtze and Shans Province, all from China were received for tests from the Secretary, Indian Central Cotton Committee, Bombay. Their mean fibre-lengths varied from 1.12" for Kiangpu with a mean fibre-weight per inch of 0.159 ( $10^{-6}$ oz) to 0.84" for Chin Yu 5 with a mean fibre-weight per inch of 0.210 ( $10^{-6}$  oz.)

4. *Agronomic Experiments.*

(a) *Sowing date experiments at Narasraopet.*—The ten varieties, 197-3, H 420, Pratap, B 5, M 5A, K 19, K 21, K 22, K 32 and Cocanadas 2 were tried

with 3 sowings in July, August, and September respectively. They were tested for upper half mean length by the Fibrograph. It was found that the July sowing in general, gave the highest upper half mean length, the August sowing came next while the September sowing had, on the whole, the shortest upper half mean length. The fineness of staple, however, was not affected either by differences in varieties or by differences in the months of sowing.

(b) *Manurial trials on Laxmi at Dharwar.*—In accordance with the decision taken at the 7th Conference on Cotton Growing Problems in India held at Chandigarh in November, 1956, 20 samples of Laxmi made up of 4 replications of 5 treatments, No., N 20 (20 lbs. N per acre), N 40 (40 lbs. N per acre), N 60 (60 lbs. N per acre) and N 80 (80 lbs. N per acre) in the form of sulphate of ammonia at the time of sowing were received for tests from the Plant Physiologist, Dharwar. Fibre tests carried out on them indicated that the various treatments had no significant effect either on mean fibre-length or mean fibre-weight per inch. But, treatments with heavy doses of nitrogen like 60 lbs. and 80 lbs. depressed the Pressley strength index values while these values for 20 lbs. and 40 lbs. N were on a par with the control with no manure.

#### IV. RESEARCH WORK IN PROGRESS

##### A. Ginning.

1. *Pre-cleaning and Ginning tests on Indian cottons (Item 1 of the Programme of work).*—It was stated in the previous Report that all the tests except fibre tests were carried out on all the samples of Gaorani 6 cotton. These tests were completed during the period under report and the results obtained were written up and published as Technological Leaflet No. 47 during the period. Similarly, the spinning, yarn and fibre tests on the samples obtained from pre-cleaning and ginning tests on P.A. 320 F were completed and the results obtained were written up and published as Technological Leaflet No. 48 during the period. Further, pre-cleaning and ginning tests, the spinning, yarn and fibre tests etc., on Sea Island Andrews cotton were carried out during the period and the results obtained were written up in Technological Leaflet No. 49. Pre-cleaning and ginning tests on 170-Co 2 cotton are in progress. The present Report, therefore, deals with the pre-cleaning and ginning tests on Sea Island Andrews and spinning, yarn and fibre tests on P.A. 320 F and Sea Island Andrews. The conclusions drawn therefrom are given below :—

##### *Sea Island Andrews :—Pre-cleaning and Ginning Tests.*

(i) *Pre-cleaning.*—The output in the H.E. opener was nearly three times that in the other two openers. The power consumption in the Platts Opener was twice that in F.E.C. which is partly due to the absence of ball bearings in Platts machine. The trash removed was highest (0.62 per cent) in the F.E.C.

(ii) *Effects of pre-cleaning.*—(a) When ginned in double roller gin, the seed-cotton opened in F.E.C. and in H.E. gave higher output and consumed lower

power than the seed-cotton opened in Platts and the unopened seed-cotton. (b) When ginned in single roller gin (single action), the unopened seed-cotton and that opened in F.E.C. gave slightly higher output than those opened in the other two openers. (c) The grader's valuation for the unopened sample was Rs. 150/- lower than that for the opened samples when ginned in single roller gin.

(iii) *Comparison of Gins*—Samples ginned in double roller gin gave slightly higher ginning percentage than those ginned in single roller gin, most probably due to crushing of seeds.

(iv) *Effects of settings and speeds*.—(a) In double roller gin, the overlap of  $7/16$ " gave a higher output of lint per hour and lower power consumption as compared with  $3/8$ " and  $1/2$ " overlaps. (b) In single roller gin, the power consumption was slightly higher for higher roller speed than for the lower roller speed.

*Sea Island Andrews and P.A. 320 F. Spinning, Yarn and Fibre Tests.*

*Sea Island Andrews*.—Samples ginned in single roller gin of single action and double roller gin gave yarns of practically the same strength. From the results, it was concluded that single roller single action gin and double roller gin could be employed for ginning this cotton. But, more experienced gin fitters would be required for making the accurate settings in the double roller gin as otherwise there may be crushing of the seeds which might lower the quality of lint and increase the waste losses. On the other hand, the settings of the single roller gin are less complicated and could be done by normally experienced fitter. Hence, from over-all considerations the single roller gin with single action seems to be more suited for ginning this type of cotton. Further the single roller single action gin is used for ginning such cottons in other parts of the world.

*P.A. 320 F*.—Samples ginned in the saw-gin gave the strongest yarns, those ginned in the single roller gin came next while the samples ginned in the double roller gin took the last place. The shorter overlap of  $1/4$ " in the double roller gin tended to yield slightly stronger yarns than the longer overlap of  $5/16$ ".

This work was done by Shri D. G. Shete.

2. *Investigations on the formation of neps during ginning. (Item 3 of the Programme of work)*.—This investigation was continued on the same lines as stated in the previous Reports and samples of P.A. 320 F and Sea Island (Andrews) cottons from the pre-cleaning and ginning experiments were tested during the period under review. A few more cottons will be tested and the results for all the varieties will be analysed and written up in the form of a paper.

This work was done by Dr. S. M. Betrabet.

3. *Economic and Technical Survey of the existing Gins in India. (Item 4 of the Programme of work).*—In accordance with the decision of the Indian Central Cotton Committee, arrangements were made for carrying out the sample survey of the ginning factories. For this purpose, it was necessary to obtain data regarding the number of gins installed in each of the ginning factories existing in the different districts of the various States in India, to group the factories with different strata based on the size of the factory. Since it was not possible to obtain this information from some States, it was decided in consultation with Dr. Panse, to make a selection of the factories on random sample basis only, without dividing them into sub-groups. Further, the Directors of Agriculture were requested to depute their subordinate officers working in various districts to get the questionnaire accurately filled up by them in consultation with the managements of the different factories. The concurrence for this proposal was obtained from all States and necessary copies of questionnaire were sent to them. Replies have begun to arrive from some States. Further, in order to have a sample check of the accuracy of the data, an Assistant from the Technological Laboratory was deputed during the period to collect data from a few factories in Mysore, Madras and Andhra States. The survey is in progress.

4. *Fabrication of an Extractor for improving the ginning of kapas containing large quantities of immature locks and hulls.*—At the meeting of the Ginning and Pressing Factories Sub-Committee held in July 1957, it was recommended that a suitable type of extractor might be designed at the Laboratory which could with advantage be utilised for removing immature locks before ginning with a view to preserve the quality of cotton lint. But, progress could not be made in this direction as the Engineering Assistant (Ginning) was fully engaged in the ginning of Sea Island Andrews cotton at Coimbatore and in the pre-cleaning and ginning tests of the same cotton at the Laboratory besides other items of work.

This work will be taken up during the monsoon months and is being done by Shri D. G. Shete.

*B. Investigations on Fibre properties.*

5. *The determination of the work done in extracting the fibres from seed surface in relation to fibre properties and percentage of seed coat removal. (Item 6 of the Programme of work).*—The investigation was carried out on the same lines as stated in the previous report and during the period under consideration eleven cottons were tested for the work of pulling per fibre from both side and chalazal regions of each seed, by testing fifty seeds for each cotton.

From the trend of the results it was noted that, except for Gaorani 12 and H 420 where the mean work of pulling a fibre from the side and chalazal regions was practically the same, in all other cottons it was significantly higher for the side region than for the chalazal region. The standard deviation for this property was found to vary considerably from cotton to cotton, from 7.90 to 34.15 (for side region fibres) and from 14.30 to 35.55 for chalazal region fibres. However,



this standard deviation for the two regions did not show any particular trend being greater for side region fibres in some cottons and for chalazal region fibres in the case of others. Practically all cottons, tested so far, showed a highly significant correlation coefficient between the maturity index for chalazal region fibres and the mean work of pulling a fibre from that region. Laxmi was the only cotton which behaved rather abnormally due to the particular sample of cotton being very immature.

The percentage of seeds which threw off seed coat fragments during testing for the work of pulling, was found to vary considerably from cotton to cotton from 0 to 70 per cent for Sea Island (Andrews) and N. 14 respectively. The correlation coefficient between the mean work of pulling a fibre from the chalazal region and the percentage of seeds which threw off seed coats was found to be significant being + 0.686, which suggests that cottons having higher work of pulling per fibre from the chalazal region are prone to throw off more seed coat fragments. However, it should be mentioned that since this correlation figure is based only on 10 cottons, it requires further confirmation.

This work is being done by Shri Jai Prakash.

6. *Variation of fibre length uniformity between seeds of the same strain. (Item 7 of the Programme of work).*—The variation of length of fibres on a single seed is an important character, as it is primarily responsible for the over-all variation that would result in the bulk sample of the particular variety when it goes under cultivation. It was, therefore, proposed to undertake some tests for determining this character. As the quantity of lint obtained from a single seed was too small to prepare a normal sliver, a small roller was employed to prepare a short sliver, which was found to work satisfactorily in the Balls Sorter, even when the produce was very small as in the *Desi* varieties of cotton. Fifty single seeds, selected at random, were tested at first but later on only 25 seeds were tested, as that number was found to be sufficient for the purpose of this enquiry. Eight cottons namely, Jarila, Laxmi, 320 F, M.C.U. 2, Vijalpa, Jayadhar, Virnar and 0394 Buri were studied during the period under review. The results obtained show that the variation from seed to seed was only about 10 to 12 per cent, while the variation within the single seed itself was about 20 to 25 per cent. The variation from seed to seed was different for different cottons, even within the same species. Generally it was found that the standard deviation increased and the co-efficient of variation decreased with increase in mean fibre-length. The work is in progress and is being done by Shri T. V. Krishnan.

7. *Study of fibre maturity, its variation from seed to seed and at different regions of the seed in relation to seed weight. (Item 9 of the Programme of work).*—This investigation was carried out along with item No. 5 described above by determining the fibre maturity for the chalazal and side regions for each of the 50 seeds of each of the eleven cottons. The results for four cottons (Jarila, Vijay, Gaorani 12 and N 14) were recorded in a paper presented at the Eighth Conference on Cotton Growing Problems in India held at Coimbatore in December 1957.

The results obtained on all the eleven cottons showed that for each cotton the fibre maturity for the side region fibres was higher than that for the chalazal region fibres. Further, in each case, the coefficient of variation, between seeds, for chalazal region fibres was significantly higher than that for the side region fibres. Furthermore, there was considerable variation in the value of coefficient of variation for the different cottons ranging from 12.39 per cent to 30 per cent, for chalazal region fibres and 6.45 per cent to 23.71 per cent for side region fibres. Each of the 50 seeds of all the cottons (except Jarila for which the seeds were not collected) were weighed and the correlation coefficient was worked out between the maturity index of the chalazal region fibres and the seed weight. The correlation coefficient was significant for seven cottons. It was not so for the remaining three.

This work is in progress and is being done by Shri Jai Prakash in collaboration with Shri V. G. Munshi.

8. *Properties of fibres collected from different regions of seeds. (Item 8 of the Programme of work).*—Previous investigations have shown that in several cottons the fibres from the chalazal region of the seeds are comparatively more immature than those from side regions of the seed. It would be interesting to find out whether such a difference in the fibre maturity was accompanied by changes in the other properties of the fibres also. It was, therefore, proposed to investigate the differences in other properties like fibre strength, fibre orientation, and degree of polymerisation of cellulose, for the fibres collected from these regions of the seeds, for a number of cottons. The work is still in the preliminary stage and is being done jointly by Shri K. S. Bhujang, Dr. V. Sundaram, Shri Jai Prakash and Shri V. G. Munshi.

9. *Study of the variation in the properties of fibres at different stages of secondary thickening. (Item 10 of the Programme of work).*—It is well-known that the cotton fibre has two distinct stages of development. During the earlier half, the fibre merely elongates while in the latter half it thickens, the secondary thickening continuing upto the day of opening of the boll. It was proposed to investigate the changes that would occur in some of the properties during the development of the fibre. The following properties, viz., wall thickness, fibre diameter, fibre strength, birefringence, X-ray angle, wax content etc., of the fibres are proposed to be studied. These determinations will be made for fibres developing at the chalazal end and at the side region of the seed. For this purpose, bolls of different ages of Devitej and Vijalpa cottons were obtained through the kindness of the Cotton Botanist, Surat.

Preliminary work on these investigations had been started and is being done jointly by Dr. S. M. Betrabet, Shri K. S. Bhujang and Dr. V. Sundaram.

10. *X-ray studies on the relationships between structural features and the physical properties of cotton. (Item 11 (a) of the Programme of work).*—During the above period, X-ray diffraction patterns of a large number of

cotton samples have been recorded on the lines already stated. Some of the patterns recorded were obtained using samples from agronomical trials while the others were obtained using standard cottons of 1956-57 season and some trade varieties. The results obtained are described below under two broad categories, namely, (a) general, and (b) samples from agronomical trials.

(a) *General :*

(i) The results obtained on the measurement of X-ray angles of 14 cottons were included, along with other results previously obtained, in a paper entitled, 'The application of X-ray diffraction method for evaluating the fibre quality, presented at the All India Cotton Spinners', Breeders' and Ginners' Conference held at Bombay in July, 1957. It was reported in that paper that highly significant correlation coefficient of  $-0.811$  was found to exist between X-ray angle and Pressley Strength Index. It is now proposed to investigate the correlation between X-ray angle and tensile strength separately for each species of cottons. A paper on 'A study of the relationship between fibrillar orientation determined by X-ray method and strength of cotton fibre, was published in the October 1957 issue of the Indian Cotton Growing Review.

A paper entitled 'Effect of cellulose structural differences on tensile properties of cotton' was read at the Second Symposium on Cellulose Research organised by the Council of Scientific and Industrial Research and held at Dehra Dun during February-March, 1958.

(b) *Samples from agronomical trials :*

A number of samples from agronomical trials were tested during this period.

In the case of cottons belonging to Indo-American Type 170 grown at Junagadh, a highly significant correlation coefficient ( $-0.93$ ) was found to exist between 40 per cent X-ray angle and Pressley strength index. These results were included in a paper entitled 'X-ray diffraction technique as an aid for assessing fibre quality in cotton breeding work' which was submitted for discussion at the Eighth Conference on Cotton Growing Problems in India held at Coimbatore in December 1957. In the case of Punjab-American cottons grown under Rice Fallows Scheme in Madras State, the value of the correlation coefficient between the X-ray angle and Pressley strength index was  $-0.925$  (highly significant at 1 per cent level). Further, the correlation coefficient between D.P. and Pressley strength index was found to be  $0.71$  (significant at 5 per cent level). An interesting result observed was that at any one place there was not much difference between the three cottons but, on the whole, the samples grown at Coimbatore were very much poorer in strength and D.P. than those grown at Aduthurai and Palur.

Laxmi cotton grown under different manurial treatments and other cottons grown with and without irrigation did not show considerable change in X-ray angle due to the treatments.

The work is in progress and is being done by Dr. V. Sundaram.

11. *Effect of neutron irradiation of cotton.*—It was proposed to find the effect of irradiating cotton with neutrons and for this purpose, samples of cotton were got irradiated at the 'Apsara' Reactor at Trombay by the kind co-operation of the authorities of the Atomic Energy Establishment, Government of India. Samples of cotton lint and cotton yarn were dewaxed before irradiating with various degrees of neutron flux. The effect on the cotton was measured by changes caused in the tensile strength and fluidity and copper number values. Preliminary tests with an irradiation flux of  $5 \times 10^{14}$  neutrons per square c.m. showed that the fibres were very highly degraded to the powder stage by this dosage. Subsequent samples were, therefore, irradiated with a dose of  $1.2 \times 10^{12}$  neutrons per square c.m. In this case, although no loss in tensile strength was observed, the fluidity value was nearly 10, showing a damage equivalent to that caused by normal bleaching. Further studies are proposed to be carried out by increasing the dosage of irradiation.

The work is in progress and is being done by Shri K. S. Bhujang and Dr. V. Sundaram.

12. *Determination of maturity of cotton by the use of the Micronaire instrument.*—In a recent publication in the Textile Research Journal, it had been shown that the Micronaire in addition to giving the fibre fineness rapidly, could also give the fibre maturity rapidly, by using a spacer of half an inch to increase the volume of the compression chamber. The difference in the Micronaire values of cotton obtained with and without the spacer was highly correlated with the Causticaire maturity of the cotton. Preliminary experiments, at this Laboratory showed that the half inch spacer would not be suitable for the Indian cottons, while one of  $3/8$ " would serve the purpose. Results obtained with this spacer for 46 cottons have shown that the difference in Micronaire value is highly correlated with the maturity coefficient, the correlation coefficient being  $+ 0.80$ . Species-wise, it has been observed that in the case of 12 cotton samples of *herbaceum* the value of the correlation coefficient between these two factors is  $+ 0.86$  and in the case of 14 samples of *hirsutum* is  $0.74$ . Further work is in progress.

It is proposed to make use of this method for rapid determination of fibre maturity and fibre weight.

This work is being done by Dr. V. Sundaram.

13. *Tests on Cotton Grader.*—A new instrument, known as the Cotton Grader, for measuring the maturity of cotton fibres by the use of polarised light has been developed in Hungary and a unit of the same has been recently received at this Laboratory. Preliminary results obtained with this instrument have indicated a good relationship between the values given by this instrument and the values obtained by the caustic soda irrigation method. For example, in the case of 12 samples belonging to *herbaceum* species, the value of the correlation coefficient

between the Cotton Grader values and the maturity coefficient was found to be  $+0.96$  and in the case of 13 cottons belonging to the *hirsutum* species, the correlation coefficient was  $0.72$ . So far about 50 cottons have been tested. Further work is in progress.

It is proposed to make use of the instrument for rapid determination of fibre maturity.

This work is being done by Dr. V. Sundaram.

14. *Determination of birefringence of cotton fibres. (Item 12 of the Programme of work).—*

The Spencer Refractometer which has been recently obtained was put into operation and the refractive indices of various liquids to be used to determine the birefringence of cotton fibres have been estimated.

Preliminary experiments were carried out to find out whether the refractive indices of cotton fibre bundles could be measured by adopting the method of Freeman and Preston used for rayon fibres. The bundle of fibres was immersed in a liquid of known refractive index and the wave length of the light that would not be scattered while passing through the liquid was determined. A monochrometer calibrated accurately with the help of mercury arc lamp and sodium vapour lamp was used for the purpose. However, this technique was found to be unsuitable for the cotton fibres as the presence of convolutions and reversals might have been responsible for the scattering of the incident light.

Another difficulty was experienced in the determination of the refractive index due to the appreciable change in the value of the index with even a slight change in temperature. Arrangements are being made to overcome this difficulty.

This work is being carried out by Dr. S. M. Betrabet.

15. *A rapid method for estimating the number of convolutions. (Item No. 13 of the programme of work).—*

As stated in the previous report the determination of convolutions is very strenuous and in order to see if any simpler method could be established, the value obtained for the number of convolutions over the entire length was compared with that obtained over the central five mm. length. The work was continued on the same lines during the period under review and tests on 10 cottons have so far been completed. The mean value for the number of convolutions over the entire length was found to be  $4.39$  per mm. as against  $4.73$  per mm. for the central five mm. length, which shows a close degree of agreement between the two, although the latter is slightly in excess. The correlation coefficient between the two has been found to be  $+0.928$ , which is highly significant. These results indicate that the simpler method of measuring convolutions over the central 5 mm. length can con-

veniently replace the old time consuming method. It is also of interest to note that the convolution angle along the central five mm. length is significantly correlated with the Pressley Strength Index. The work is in progress and is being done by Dr. S. M. Betrabet and Shri K. P. R. Pillay.

16. *Comparison of the fibre-length irregularity percentage, the coefficient of fibre-length variation and the uniformity ratio (fibrograph) (Item 15 of the Programme of work).—*

The chief results of this investigation have been embodied in a paper entitled 'Relationships between the fibre-characters measured by the Fibrograph with similar characters obtained by the Balls Sorter' which was read at the 8th Conference on Cotton Growing Problems in India held at Coimbatore in December 1957.

This work was done by Shri Harirao Navkal.

17. *Rigidity of fibre bundles. (Item 16 of the Programme of work).—*

It was stated in the last report that a device for determining the rigidity of fibre bundles had been fabricated and that 16 cotton samples had been tested using this device. The bundle rigidity was found to vary from 175.2 dynes/cm<sup>2</sup> for 1027 ALF Surat to 135.8 dynes/cm<sup>2</sup> for Sea Island (Andrews). Single fibre rigidity measurements on some of these cottons were determined with a view to find out how far the two sets of values agree with each other. Six cottons have so far been tested for the latter and a good agreement has been found to exist between *bundle rigidity* and single fibre rigidity where  $n$  = number of fibres in the bundle. The work is in progress and is being done by Shri N. Balasubramanian.

18. *Effect of dewaxing cotton fibres on their Micronaire readings (Item 17 of the Programme of work).—*

The indirect methods of measuring the fineness of cotton fibres (with Micronaire, Arealometer, Air-permeameter, Port-ar, etc.) are all based on the assumption that the resistance offered to the passage of air by a fixed mass of cotton (when the pressure differential is the same) depends on the specific area *i.e.*, the area per unit volume or mass of cotton. This investigation has been undertaken with a view to find out whether the resistance offered (under the conditions stated above) depends also upon the nature of surface: if this were the case, since dewaxing would alter the nature of the surface, the Micronaire reading of the dewaxed sample might be expected to be different from that of the normal sample of the same cotton. So far, no great difference has been found after dewaxing. It is proposed to continue the experiment by selecting some cottons with high wax-content with a view to ascertain whether any appreciable difference could be found at least in these cases.

This work is being done by Shri Harirao Navkal.

19. *Comparison of Pressley strength index with the Stelometer value strength.*—

The Stelometer was recently acquired by the Laboratory and in order to find out how the results obtained by this instrument compared with the value got by the Pressley Strength tester, which is being used in the Laboratory for a long time, comparative tests were undertaken with both these instruments. The same set of clamps were used in both the machines and tests were made on the same sliser in each case. It was found that the Pressley strength index (expressed in lb/mgm.) was about twice the value obtained by the Stelometer (expressed in gm/grex), the rate of loading in the Stelometer being 1 kg in 1.6 secs. The correlation co-efficient between the Stelometer value and the Pressley value was +0.89 for 0 gauge length. As the Pressley instrument could not take in clamps of 1/8" gauge-length, on comparisons could be made for that gauge-length.

The percentage extension at break when compared with the breaking load showed that the extensibility was negatively correlated ( $-0.52$ ) with the strength of the fibre. This shows that weaker cottons are more extensible than stronger ones.

This work is in progress and is being done by Shri V. G. Munshi.

20. *Effect of Agronomical treatment on fibre properties.*—  
(Item 46 of the Programme of work).

A large number of planned agronomical experiments are being carried out at various Cotton Research Stations, with a view to increase the yield of cotton. It was, therefore, proposed to make use of this material for finding the effect of various agronomical factors on fibre properties, such as, strength of attachment of fibres to the seeds, ginning percentage, mean fibre-length, fibre length irregularity, fibre fineness, maturity, fibre strength, degree of fibrillar orientation and degree of polymerisation of cellulose. It was also proposed to investigate whether these agronomical treatments had any effect on the oil content of the cotton seeds.

Samples have already been received from replicated treatments of three types of experiments, namely, (i) frequency of irrigation-cum-manurial treatment, (ii) intensity of irrigation, frequency of irrigation and manurial treatment, and (iii) hormone treatment.

So far the seed weight, lint weight and the ginning percentage of the samples belonging to groups (i) and (ii) have been determined and determination of the other properties is in progress.

This work is being done by Shri T. V. Krishnan, Shri K. S. Bhujang, Dr. V. Sundaram, and Shri Jai Prakash.

21. *Setting of the Instron Tensile Strength Tester.—*

This instrument was very recently received at the Laboratory. It is a very expensive instrument and is a gift to the Laboratory under the T. C. M. Programme of U. S. A. It is an elaborate, versatile tensile testing instrument which can measure the strengths ranging from a few grams to thousand or more kilograms. The instrument has been set in operation. A few minor discrepancies observed have been brought to the attention of the authorities concerned and it is hoped that they will be set right in the near future.

It is proposed to undertake determination on the tensile properties of cotton fibre and yarn by utilising this instrument.

This work is being done by Shri Jai Prakash.

22. *The relationships between the Micronaire readings and the fibre-weight per unit length obtained by weighing whole fibres.—*

A paper embodying the salient results obtained during this investigation was read at the Seventh Conference on Cotton Growing Problems in India held at Chandigarh in November 1956. During the period under review this has been published as a bulletin (Series B, No. 61).

This work was carried out by Shri Harirao Navkal.

C. *Investigations on Fibre Properties and Yarn Characteristics.—*

23. *Relationships between yarn strength (single thread) and the chief fibre-properties.—*

The results of this investigation were embodied in a paper read at the Seventh Conference on Cotton Growing Problems in India held at Chandigarh. This paper was published as a bulletin (Series B, No. 57) in October, 1957.

This work was carried out by Shri Harirao Navkal.

24. *The relationships between the yarn-strength irregularity (single thread) and the chief fibre-properties. (Item 18 of the Programme of work).—*

The chief results of this investigation were embodied in a paper read at the All India cotton Spinners', Breeders' and Ginners' Conference held at Bombay in July 1957.

This work was carried out by Shri Harirao Navkal.

25. *Prediction of the Spinning Values of irrigated cottons from their chief fibre-properties. (Item 19 of the Programme of work).—*



In connection with this investigation 48 samples from Punjab and 56 samples from Madras have been tested for the following fibre properties :—(i) mean length, (ii) length irregularity percentage, (iii) weight per unit length, (iv) maturity percentage, (v) strength and (vi) intrinsic strength.

The data collected are being analysed statistically. It is proposed to give a general equation to estimate the spinning value (Highest Standard Counts) from (a) all the fibre-properties and (b) some selected fibre-properties which are found to be of importance as a result of this analysis.

This work is being done by Shri Harirao Navkal.

26. *Performance of mixings of Indian cottons with special reference to their fibre properties. (Item 20 of the Programme of work).—*

As a result of long continued experiments a large amount of data regarding the fibre properties of various Indian cottons and their mixture has been collected. A number of different yarns have been spun from these cottons in the pure state and from their suitable mixtures too. The results are under examination.

This work is being done by Shri V. V. Gupte.

27. *Measurement of fibre-bundle strength at different twists and gauge lengths. (Item 21 of the Programme of work).—*

The results are being analysed for writing up a paper.

28. *Relationship between yarn-evenness and fibre properties. (Item 24 of the Programme of work).—*

In the previous report the dependence of yarn evenness on fibre length variation was reported. In order to ascertain this relationship more closely, coefficient of variation of fibre length was correlated with the irregularity of 20s yarn spun from it, as measured by the Uster Evenness Tester. From the results of 15 cottons a highly significant correlation (0.75) was found between index of irregularity and coefficient of fibre length variation and a significant correlation (0.58) was obtained between excess irregularity and coefficient of fibre length variation. As the same roller settings had been adopted in spinning all these cottons, it is likely that there would be greater proportion of uncontrolled or floating fibres during drafting in the case of shorter cottons, which might tend to increase the yarn irregularity of these cottons. In order to eliminate this effect partial correlation coefficients were worked out and it was found that there was an increase in the value of the correlation coefficient in the case of excess irregularity and coefficient of fibre length variation. Based on these findings a paper was written up and read at the All India Textile Association Conference, held in January 1958.

Further tests were made on similar lines on 21 more cottons. From the results on 36 cottons the following correlation coefficients were obtained :

$$r_{13} = 0.8140$$

$$r_{23} = 0.8316$$

$$r_{13.4} = 0.8268$$

$$r_{23.4} = 0.8479$$

where

- 1 = Index of irregularity
- 2 = Excess irregularity
- 3 = Coefficient of fibre length variation
- 4 = Mean fibre length

It is proposed to continue the work by testing some more cottons. The work is done by Shri N. Balasubramanian.

29. *Defects in some of the superior long stapled cottons of India and some remedial measures :*

A paper on this subject was read at the All India Cotton Spinner's, Breeder's and Ginner's Conference held at Bombay in July 1957.

It has been pointed out here that some of the extra-long varieties grown in India do not spin well because (a) too much of emphasis has been laid by the Breeders on the mean fibre-length and not on the other important properties (intrinsic strength, fineness or uniformity in length), (b) the deterioration in quality that usually takes place when a variety passes from the Government farm to the cultivator is greater than usual for these special varieties, (c) the variation in the quality of material from farm to farm is also high in these cases so that when the pooled produce reaches the market or mill, it exhibits wide variation in all its characters, and lastly, (d) there is a likelihood of the fine fibres being damaged or broken by the bad quality of gins or excessively high speed that is employed during ginning. Some remedial measures have been suggested.

This paper was read by Shri Harirao Navkal.

D. *Investigations on Spinning and Yarn Characteristics.*

30. *Effect of counts, twists, and drafts in the ring frame on the yarn strength. (Item 22 of the Programme of work):*

The Laboratory has an empirical formula to obtain the count strength product (C.S.P.) for nominal counts from the C.S.P. of actual counts. To test the accuracy of this formula by experimental results, 17 different cottons were spun with seven different drafts in the ring frame to obtain counts coarser and finer than 30s. Except in the case of two cottons there was a fair agreement between the cal-

culated C.S.P.'s from the different actual C.S.P.'s. However in the case of these two cottons the calculated C.S.P.'s had a tendency to go down in value as the actual counts became finer.

This work was extended to 20s counts and there the tendency invariably is to get a lower calculated C.S.P. as the actual counts spun become finer. This work will be continued on some more cottons particularly in the coarser counts.

This work is being done by Shri V. V. Gupte.

31. *Combing of good quality Indian cottons. (Item No. 28 of the Programme of work) :*

It has been found in the previous years that some of the good quality Indian cottons when subjected to combing give equally good yarns as those manufactured from East African cottons in the carded state. So during the period under review two cottons, 320 F and 170 Co 2, were spun into 30s warp and 40s weft in the carded state and 44s warp and 50s weft after combing. A. R. B. P. 52, the well known East African cotton was also spun into these same four counts, but only from carded sliver. Testing of the different yarns has been completed during the period under review. Various fibre tests were also carried on the lint samples of these cottons. A leaflet will soon be written up on the work done in connection with this problem.

This work is being done by Shri V. V. Gupte.

32. *Evenness of material at different stages of processing. (Item 25 of the Programme of work) :*

The study on the variation of the irregularity of a fibrous strand with the different stages of processing (from card to ring frame) adopted at the Technological Laboratory was mentioned in the previous Report. Based on these findings a paper entitled 'Evenness of material at different stages of processing' was read at the All India Cotton Spinner's, Breeder's and Ginner's Conference, held at Bombay in July 1957.

These same work was continued on similar material from 17 standard Indian cottons during the present period. From the results it is noted that the irregularity of draw frame sliver did not vary much from cotton to cotton although there was considerable variation in the irregularity of card sliver from cotton to cotton. From this it can be concluded that irrespective of the initial irregularity of card sliver, two heads of draw frame are capable of bringing the level of irregularity to a standard low value. The irregularity of material is found to increase slowly at the speed frames with a steep increase in the ring frame. The index of irregularity, however, shows an inverse trend and diminishes continuously as the processing proceeds from drawing to spinning.

These findings are in conformity with the previous ones on ten cottons. The results are being statistically analysed.

This work is being done by Shri N. Balasubramanian.

33. *Standardisation of yarn evenness :*

As reported previously, samples of yarns of different counts and evenness classes were tested with the Uster Evenness Tester with a view to prepare yarn evenness standards. About 150 samples have been tested so far and the results obtained show that the mean deviation percentage increases with evenness class for all the counts. However, as the number of samples from extreme range of evenness classes are small, more samples from these evenness classes are being tested with the Uster Evenness Tester.

The work is in progress and is being done by Shri N. Balasubramanian.

34. *A study of the variation of irregularity of a fibrous strand with draft and hank number :*

A set of slubbings of five different hank numbers (2 lighter and 2 heavier than the normal) were prepared using the same drawing sliver, by varying the draft at the slubbing frame. The draft was varied by changing the draft wheel in steps of two teeth. The irregularity of drawing sliver and of each of the slubbings was determined with the Uster Evenness tester. Each of the slubbings was then utilised to produce inter of the same hank by varying the draft at the inter frame (in the reverse order). The irregularity of each of the inters was also measured with the Uster Tester. From the results of tests on three cottons it was found that the variation in draft introduced at the two frames was too small to cause any significant difference in the irregularity of the resulting strand. Hence, it is proposed to conduct the same experiment by varying the draft in larger steps at both the frames.

This work is in progress and is being done by Shri N. Balasubramanian in co-operation with Shri V. V. Gupte.

35. *Construction of a small card. (Item 26 of the Programme of work).—*

This work has been completed and the card can be worked by hand as well as by a small electrical motor.

Its usefulness for opening cotton samples for Micronaire tests was tried and the performance compared with the standard method of the Laboratory namely bow opening. 28 different cottons were opened both by bow and by this card and then the Micronaire tests carried out on these samples of opened lint. It was found that invariably the indices of the two types of lint were very close to each other and the differences, if at all any, were within the range of experimental error.

It can, therefore, be concluded that this card can well be used for opening lint for Micronaire tests.

The utility of this card for determining the nep potential is yet to be tried.

This work was done by Shri V. V. Gupte.

36. *Investigation on the effect of different processing treatments on the spinning value of M.A.V. (Item 27 of the Programme of work).—*

It may be re-called that an experiment which included several treatments was designed for this cotton with a view to ascertain the optimum treatment necessary to obtain the strongest yarns.

The vast amount of data collected is being analysed statistically ; some of the findings dealing with the main effects have already been given in the last Annual Report.

As several first and second order interactions were significant and as most of these contained the factor 'system of spinning', the main analysis of variance table was split up into 3 tables, each one of which applies to a particular method of spinning. Even in these tables, several interactions of the first and second order have been found to be significant. This means that these tables may have to be split up again further before any tangible conclusions could be arrived at.

The calculations are being continued.

Most of the spinning work was supervised by Shri A. G. N. Iyengar and the remaining by Shri V. V. Gupte. Fibre tests and calculations are being supervised by Shri Harirao Navkal.

37. *Further work on the micro-sample spinning technique. (Item 32(a) of the Programme of work).—*

A paper dealing with the above subject entitled 'Further spinning tests on micro-samples of cotton' was published as Technological Bulletin Series B, No. 58 in October 1957.

This work was done by Shri V. V. Gupte and Shri Harirao Navkal.

38. *Further extension of micro-spinning technique. (Item 32 of the Programme of work).—*

A full paper titled as 'Assessment of spinning value of cotton by spinning a small sample' was written up and sent for publication. The method of finding the highest standard counts of any sample of cotton by the micro-sample spinning method is described in the paper. From the experimental results detailed therein,

it is concluded that when necessary the highest standard counts could be determined by the micro sample method and the equation connecting the H.S.C. by bulk method with micro method is

$$X = 0.66 Y + 10.84$$

where X is H.S.C. by bulk method and Y is H.S.C. by micro method.

This work was done by Shri V. V. Gupte.

39. *Ballistic work of rupture of a single thread. (Item 29 of the Programme of work) :*

The results are being analysed with a view to write up a paper.

40. *Study of the variation in yarn-strength and in yarn-count at different portions of the bobbin. (Item 34 of the Programme of work) :*

In order to find out whether there is any systematic variation of count and strength in the yarn at different portions of the bobbin,lea test results of 33 cotton samples were analysed for each of the following counts, viz., 6s, 8s, 10s, 12s, 20s, 30s and 40s. There was a tendency for counts to become finer from the top to the bottom of the bobbin. The strength decreased for counts 6s to 12s while it increased in the case of the other counts from the top to the bottom. In order to eliminate the effect of variation in count, individual readings for corrected strength for each bobbin were tabulated and analysed for 5 samples of 20s yarns. This analysis confirmed the above conclusion that the strength increased from the top to the bottom of the bobbin. Similar analysis is in progress for 30s and 40s yarns.

The data for this problem were collected by late Shri H. B. Joshi and the statistical analysis is being done by Shri V. Venkataraman.

41. *Estimation of the spinning value of a cotton from its chief fibre-properties, or a review of the studies of the relationships between the spinning value and the chief fibre-properties of a cotton :*

As mentioned in the last Annual Report, this paper had been sent up for publication. It is being published in the form of a bulletin (Series B, 56).

This work was done by Shri Harirao Navkal.

42. *Mill and Laboratory tests :*

A number of cottons were subjected to these tests every year. A paper on 'Comparative mill and Laboratory tests, on improved varieties and trade varieties of Indian cottons' was prepared during the period to be read at the 8th Conference on Cotton Growing Problems in India, held at Coimbatore in December, 1957, as stated earlier in this Report. It was found that in the case of one mill, the mill

test results for 40s counts were consistently slightly higher than the corresponding Laboratory tests. Causes for this were investigated and it was decided to spin a few samples on casablanca high draft system with double roving for comparing the results with the normal Laboratory practice of single roving and three roller drafting. Seventeen cottons were taken up for these tests and it was found that on an average about 12 per cent higher strength was obtained when these cottons were spun into 40s counts with double roving on casablanca A 500 system than that obtained with the normal Laboratory practice. It has, therefore, been decided that in the case of superior varieties of cotton, the results should be obtained under both these systems for information.

*E. Chemical Problems.*

*43. Fibre maturity determination by differential dyeing. (Item 36 of the Programme of work) :*

As it was decided to have some trial tests of this method made by the Technological Assistants at the different breeding stations, standard shade cards were prepared consisting of four shades corresponding to maturity values of 70, 60, 50 and 40 and sent along with the details of dyeing procedure. Twelve cotton samples of different maturity were also sent for estimating the maturity by dyeing them and comparing the shades with the standard shade card.

The results were obtained from five stations while at the remaining three stations the tests could not be carried out for want of necessary facilities. The results showed that most of the dyeings at various stations appeared to be deeper than expected probably due to the use of local hard water. It is desirable that either distilled water should be employed at all the places or standards should be prepared at the respective places so as to maintain identical conditions for further tests. Though the results from some of the stations are fairly satisfactory yet it seems that more practice is necessary both in dyeing and in visual estimation for the successful application of this technique in the breeding stations. It is proposed to give further training to the Technological Assistants during their ensuing refresher course and to have further trials later on.

This work is being done by Shri K. S. Bhujang.

*44. Evaluation of D.P. values of Indian cottons by different methods. (Item No. 38 of the Programme of work) :*

(a) The method generally employed for the D.P. estimation consists in the measurement of viscosities of 0.5 per cent solutions in cuprammonium hydroxide in the B.C.I.R.A. viscometers and in the calculation of the D.P. values from the viscosity results by employing Battista's formula. As the cuprammonium solution is susceptible to oxidation by atmospheric oxygen there are chances of the degradation of the sample during the viscosity estimation which would lower the D.P. values.

It was therefore, proposed to employ cupri-ethylene diamine solvent and carry out the D.P. estimations in absence of oxygen. For this purpose Cannon Fenske viscometer has been set up and the flow of the solution through the viscometer is effected by applying different nitrogen pressures. The constants of the viscometer have been determined. The cupri-ethylene diamine solution is prepared according to A.S.T.M. method. The solutions of raw cotton were found to be non-Newtonian in nature. For this purpose the viscosity counterpart as put forth by Whitewell *et al* was calculated. The work on the estimation of D.P. of raw cotton from the viscosity counterpart by this method is in progress.

(b) The D.P. estimations of samples of cotton grown under different soil and climatic conditions were carried out by the cuprammonium viscosity measurements and some differences were noted in certain cases.

The work is in progress and is being done by Shri K. S. Bhujang.

45. *The nature of degradation of the wastes collected at different stages of processing :*

In order to determine the nature of degradation in the wastes collected at different stages of processing it was decided to carry out the cuprammonium viscosity tests for estimating the chemical degradation, congo red test for determining mechanical degradation and also strength tests. Three cottons Jayadhar, M.C.U. 2 and 320 F were processed and samples collected at different stages. Some viscosity determinations have been made.

Further work is in progress and is being done by Shri K. S. Bhujang.

46. *Investigations on the mercerisability of Indian cottons. (Item No. 39 of the Programme of work) :*

Some of the crochet yarns are coarse doubled yarns which are usually mercerised. It was felt that some of these yarns could be made from Indian cottons if the mercerisation properties were comparable to those of foreign varieties.

In order to carry out these investigations samples of 20s yarns of M.C.U. 1, Jarila, Jayadhar, Virnar and Karnak cottons with 17.98 T.P.I. for all the Indian cottons and 12.96 T.P.I. for the Egyptian cotton were prepared and doubled in the doubling machine at the Victoria Jubilee Technical Institute, Matunga. The doubled yarns were further boiled and bleached uniformly in identical conditions at the Department of Chemical Technology, University of Bombay, Matunga.

Small hanks of these yarns were mercerised in the Laboratory apparatus specially designed for the purpose under uniform conditions of time, tension, temperature and concentration of caustic soda solutions. Lustre numbers were estimated in the Laboratory lustre-meter. The results indicated that the Egyptian



cotton yarn showed the highest lustre number in this group while M.C.U. 1 and Virnar also showed good results.

More number of tests will be carried out and further attempts will be made to improve the degree of mercerisation of the Indian cottons by special treatments.

This work is being done by Shri K. S. Bhujang.

47. *Studies in the chemical modification of cottons. (Item 41 of the Programme of work) :*

It was decided to carry out cyano-ethylation experiments by treatment of cotton with acrylonitrile.

Only a small quantity of acrylonitrile monomer (5 lbs.) could be obtained from National Chemical Laboratory of India, Poona. The treatment of fibre was carried out in small lots of 25 gms. at a time. About 100 gms of raw cotton has been treated under almost identical conditions of concentration, time and temperature so as to get the nitrogen content of 4 to 5 per cent. The percentage of nitrogen of each lot has been estimated by the standard Kjeldahl method and the values are well within the limits given above.

The sample, after the treatment was found to be much knotted and to have become harsh. The work on the different properties of the sample and the spinning tests are in progress.

The work is being done by Shri K. S. Bhujang.

48. *Determination of the oil contents of the different varieties of cotton seeds. (Item 42 of the Programme of work) :*

During this year the oil content of about 50 cotton seed samples of 1956 season and about 160 cottons of 1957 season was estimated.

It was found that unlike last year's observation where *arboreum* seeds had given the lowest values, this season they have given fairly high values, quite comparable with the *hirsutum*s. The average value for the *herbaceum* species has remained more or less constant.

The seven samples sent from Gadag belonging to *hirsutum* species gave very low oil content unlike last year, probably due to some deficiency in the growth of the plants. The seeds were very much undeveloped.

The oil contents of the seeds were compared with other fibre characters such as, (i) length (ii) fibre weight and (iii) ginning percentage which were obtained from the breeding stations. No correlations were observed.

The linter percentage of some of the seeds of different species was determined in the Laboratory by gassing the seeds in hydrochloric acid fumes and dusting out all the fuzz from the seeds.

The kernel weight and hull weight of some of the seed samples of each species were determined by carefully cutting out and separating out the seeds of one gram of each sample.

It was found from the results that both *arboreum* and *herbaceum* seeds yielded very low percentage of linters whereas the *hirsutum* seeds yielded high percentage of linters. It was interesting to note that the *garohill* cotton seeds which belong to the *arboreum* species yielded high percentage of linters but very low percentage of oil.

The oil contents of all the varieties tested showed good relationship with the kernel weight and it was found that when the oil content was calculated on the kernel weight the content of both *arboreums* and *hirsutums* was almost the same.

This work is being done by Shri K. S. Bhujang.

#### F. Miscellaneous.

##### 49. Commercial grading of cotton (Item No. 43 of the Programme of work) :

At the instance of the Agricultural Marketing Adviser to the Government of India, tests were undertaken for collecting data which would provide some idea of the range of variation in (i) wastiness or trash content, (ii) fibre-properties and (iii) the spinning value of Vijalpa (2087) cotton grown in different parts of the country. For this purpose 184 samples of Vijalpa were received from the Cotton Superintendent, Surat. Tests on these samples for the following properties were completed during the period under review.

- i) Weight of trash (Shirley Analyser),
- ii) Total loss (Shirley Analyser),
- iii) Mean fibre-length,
- iv) Micronaire fineness,
- v) Maturity,
- vi) Swollen hair diameter,
- vii) Pressly strength index, and
- viii) Lea strength of 30s yarn spun according to the micro-sample spinning method.

These data have been sent to the Government of India.

This work was supervised by Shri Harirao Navkal and Shri V. V. Gupte.

##### 50. Reduction of neps in standard Indian cottons. (Item 44 of the Programme of work) :

Studies on the reduction of neps in the progenies of the following standard Indian cottons were completed : H 420, 1027 A.L.F., Suyog, Vijay, N. 14, Jayadhar, Co 2, Co 3, M.C.U.1. K 2 and Laxmi.

In all, 85 samples were tested for neps as well as for maturity, mean length, ginning percentage, incidence of immature and insect attacked seeds and proneness to seed coat removal in ginning. The seeds of the promising samples have been propagated in the respective cotton breeding stations.

The results so far obtained are highly encouraging inasmuch as a definite trend in the reduction of neps has been brought about. Mass pedigree selection method is being followed at present. However, as the numbers of rows grown are small, the field of selection is rather restricted. By widening the field more useful results may be obtained. It is therefore, proposed to continue the work by making single plant selections and confining it to varieties which are highly susceptible to neppiness.

This work is in progress and is being done by Dr. S. M. Betrabet.

51. *Effect of agronomical treatments on neppiness. (Item 45 of the Programme of work) :*

The results of these tests are being statistically analysed.

52. *Standard regain values for raw cotton, cotton yarn and fabrics. (Item 47 of the Programme of work) :*

This investigation was undertaken at the Laboratory on the request of the Millowners' Association, Bombay, in order to find a standard regain figure for raw cotton and cotton piecegoods. A large number of samples of cotton lint, both raw and cleaned in Shirley Analyser, of cotton yarn and of cotton fabric with different treatments (such as, grey, bleached, dyed, mercerized, etc.) were pre-conditioned at a low humidity and conditioned at the standard humidity of 65 per cent R.H. and their moisture regain in the conditioned state was determined. It was found that on the average the value for raw cotton was near about 8.5 per cent moisture regain, the accepted international value for raw cotton while it was about 7.5 per cent moisture regain for the cotton yarns and fabrics. A detailed report on these samples has been submitted to the Millowners' Association.

This work was done by Shri Jai Prakash.

53. *Standardization of Shirley Analyser testing. (Item 48 of the Programme of work) :*

A full paper named 'A comparison of different methods of testing by the Shirley Analyser' was written up during the period under review. From the data

obtained during these experiments it is concluded that it is not quite necessary to adopt the proposed procedure of the International Organisation for Standards (I.S.O.) which is long and time consuming for Shirley Analyser tests. The results obtained by the proposed I.S.O. method could be calculated by use of regression equations from those obtained by following the Technological Laboratory method.

This work was done by Shri V. V. Gupte.

54. *Standardisation of the nep-counting technique for cotton lint :*

As stated in the last report the paper containing the results of the investigation had been sent for publication. It was published during the period under review as Technological Bulletin Series B, No. 59.

This work was done by Dr. C. Nanjundayya, Dr. R. L. N. Iyengar, Shri Harirao Navkal and Dr. Rajaraman.

55. A summary of the research work carried out by the Senior Assistants (Technological) attached to the various Cotton Breeding Stations is given in Appendix I.

#### V. GINNING SECTION.

Most of the work done in this Section during the year under report has been described under the head 'Research work in Progress'. An outline of the chief items is, however, given below.

Pre-cleaning and ginning tests were carried out on Punjab American 320 F and Sea Island Andrews cottons and all tests were completed. Technological Leaflets (Nos. 48 and 49) were prepared on them. The leaflet on P.A. 320 F was sent to the Press for publication while the other is being sent. The pre-cleaning and ginning tests on 170-Co 2 variety are in progress.

Ginning percentages of 15 trade varieties of 1956-57 season and 10 trade varieties of 1957-58 season were determined with a view to include these results in the Technological Circulars which are being published on these trade varieties.

About 200 small samples of *kapas* received from agronomic experiments for tests and a few others obtained from different sources were ginned in the Laboratory gin and their ginning percentages determined.

In spite of giving sufficient publicity to the Ginning Training Course, only 5 fitters from a Ginning Factory at Khamgaon took advantage of this course.

The Engineering Assistant (Ginning) attended to the ginning of Sea Island Andrews cotton, grown in Kerala and Mysore States, at a Ginning Factory at Coimbatore. The gin was specially set for proper ginning of this long staple fine cotton

with naked seeds. He also visited the ginning factory at Arsikere to ascertain the possibility of ginning the Mysore produce at that factory but the condition of the machinery was found to be unsuitable for this purpose.

#### VI. PUBLICATIONS.

A list of publications issued by the Laboratory during the year together with the summaries of the bulletins and articles published is contained in Appendix II.

#### VII. SUMMARY.

This report gives an account of the work done during the year, 1957-58, at the Technological Laboratory. Very substantial progress has been recorded in the various activities of the Laboratory, as will be seen from the report, a summary of which is given below.

*Tests for the State Agricultural Departments.*—The total number of samples received for various types of tests from the Agricultural Departments of various States was 3,148 as against 2,273 samples received during the previous year, recording an increase of as much as 38 per cent. Most of these samples were tested and reports of different categories were issued. Most of the testing work related to the evaluation of the quality of new strains and improved varieties which proved to be of immense utility to the Breeders in their selection work. Some of these also belonged to the improved varieties under various stages of multiplication. A few items of special interest are given below.

1. Results for nine varieties raised in four different centres in Khandesh and Ahmednagar indicated that C.J. 73 was outstanding among them and Y 1 (Sup. bulk) came next in order.

2. Tests carried out 134-Co 2 M from 25 different centres last year and 13 different centres in the current year showed that the average mean fibre-length had decreased to 0.98" by 4 per cent while the average performance was 3 counts less as compared with last year.

3. Tests made on 170-Co 2 from 14 different centres last year and 19 different centres in the current season had indicated that this variety had maintained its mean fibre-length and spinning quality of the last season and was 12 per cent finer in staple in the current season. Furthermore, the rainfed samples had given better spinning value than the respective irrigated samples. Similar tests carried out from 7 different centres in the Deccan canals area in the current year indicated that the average mean fibre-length was 1.02" and the average spinning value lay in the neighbourhood of 40s counts.

4. Samples belonging to several agronomic experiments such as manurial trials, spacing experiments, different sowing dates, methods of sowing, etc., were tested and reported to the respective Breeding Stations.

5. Mill tests were carried out on a large number of improved varieties, such as Y 1, C.J. 73, 170-Co 2, 1494, 1946, 1422, 0296-7, 0394, 147, 13 A, B 12 A, Malini, Sea Island Andrews, 15-39 X, 16X, 9030, Maljari, A 51-9, C.T. 1. 4-21, 35/1, 216F, 320F, L.S.S., H 14, etc., and reports were issued to the respective Officers.

6. Sea Island Andrews had spread over a wider area in Kerala State and samples from 9 different centres were tested in the current season. It was found that this cotton showed good improvement over last year and the samples were found suitable for spinning 80s standard carded yarns. About 20 bales were available in the current season.

*Tests for the cotton trade and the textile industry.*—Technological bulletins on trade varieties of fair average quality and on standard cottons grown in the experimental stations were published for general information. Technological circulars on each trade variety were issued as soon as tests were completed. These publications proved quite useful to the cotton trade and the textile industry. Ginning percentages of trade varieties were also determined and added in the bulletin. Furthermore, tests for fibre properties such as Micronaire value and Pressley strength index were made on trade varieties and included in the circulars and Technological Bulletin issued on them. Digvijay was added to the list of standard and trade varieties for the first time in the current season.

The Testing House of the Laboratory received a very large number of samples for various tests, the total during the year being 1,563 as against 1,104 last year recording an increase of as much as 42 per cent. Tests on some of them were of a special nature, such as the cause of tendering, effectiveness of some chemicals against mildew attack, samples for criminal investigation, etc., etc.

*Research Work.*—Considerable progress was made in most of the items of research work. Progress in each item is briefly described below.

*A. Investigations on Ginning :*

1. Pre-cleaning and Ginning tests were carried out on Sea Island Andrews cotton raised in Kerala and on P.A. 320 F cotton. Fibre, spinning and yarn tests were carried out on the samples obtained therefrom. Test results were written up and a Technological Leaflet (No. 48) describing the performance in precleaning machines and the optimum settings and speeds in the different gins for P.A. 320 F to yield maximum output and best quality lint was published during the period. A similar Technological Leaflet (No. 49) on Sea Island Andrews cotton was prepared and is being sent to Press. It was found that though double roller gin and single roller gin of single action would be suitable for this extra-long staple cotton, from overall considerations, the latter gin seems more suited for ginning this type of cotton. The Technological Leaflet (No. 47) on Gaorani 6 variety was also issued during the period.

2. For the purpose of conducting an economic and technical survey of the existing gins in India, factories in each State were selected on random sample basis totalling 350 factories on the whole and copies of the questionnaire, which was finalised, were forwarded to the Directors of Agriculture of each State to get them accurately filled up by the managements of the different factories by deputing subordinate officers for this purpose. An Assistant from the Laboratory was also sent to Andhra, Mysore and Madras States to visit a few factories and get the forms filled up as a sample check. Replies to the questionnaire are being received from the different States.

*B. Investigations on fibre-properties :*

3. A paper entitled 'A study of the variation of fibre-maturity at different regions of the seed and from seed to seed in relation to seed weight variation' was prepared on the results of tests for 4 varieties and presented at the 8th Conference on Cotton Growing Problems in India held at Coimbatore in December 1957.

4. Preliminary studies on the variation of fibre-length in each single seed were made in order to see how far it would be possible to improve this character.

5. The results obtained on the measurement of X-ray angles of 14 varieties along with other results were discussed in a paper 'The application of X-ray diffraction method for evaluating fibre quality' which was read at the All India Cotton Spinners', Breeders' and Ginners' Conference held at Bombay in July 1957. A second paper on the tests carried out on samples from agronomic trials etc., entitled 'X-ray diffraction technique as an aid for assessing fibre-quality in cotton breeding work' was read at the 8th Conference on Cotton Growing Problems in India held at Coimbatore in December, 1957.

6. A paper on the standardisation of the nep-counting technique evolved for cotton lint at the Laboratory was published in the January 1958 issue of the Indian Textile Journal. It was also published as a Technological Bulletin (Series B, No. 59) of the Laboratory.

7. A quick method for determining the number of convolutions in cotton fibre was evolved and standardised. It was found that the enumeration of convolutions along the central 5 mm. length of the fibre would suffice since this number had a high correlation with the total number of convolutions along the whole length of the fibre.

8. A paper on the relationships between the fibre characters measured by the Fibrograph with similar characters obtained by the Balls Sorter was prepared and read at the 8th Conference on Cotton Growing Problems in India held at Coimbatore in December 1957.

9. A Ballistic tester to measure the work done in pulling fibres from seed was designed at the Laboratory and a paper entitled 'Design of a ballistic tester and

experiments carried out with it on three types of materials' was published in the May 1958 issue of the Indian Cotton Growing Review.

10. Preliminary experiments carried out on the Micronaire at the Laboratory for measuring the fibre maturity rapidly in addition to fibre fineness has been found to be quite successful and after some further confirmatory tests it is proposed to make use of this method for rapid determination of fibre-maturity and fibre-weight at the same time.

11. A paper entitled 'Effect of Cellulose structural differences on tensile properties of cotton' was prepared and read at the second Symposium on Cellulose Research organised by the Council of Scientific and Industrial Research held at Dehra Dun in February-March 1958.

12. An apparatus for rapid measurement of the fibre-maturity called the Cotton Grader, developed in Hungary, was tested and found to give satisfactory results for cottons which are not highly mature. It is proposed to acquire it for the use of the Laboratory.

13. A paper on the relationships between the Micronaire readings and the fibre-weight obtained by weighing whole fibres was prepared and published in the March 1958 issue of the Indian Cotton Growing Review. It was also published as a Technological Bulletin (Series B, No. 61) of the Laboratory.

14. The measurement of tensile strength of cotton samples using the Stelometer is in progress. The relationship between the breaking strength of fibre-bundles at 0" and 1/8" gauge lengths and X-ray angles of different varieties of cotton is being investigated. A high correlation has been found to exist between the value obtained using the Stelometer and the Pressley strength index, both measured at 0" gauge length.

15. A paper on 'Microbial degradation of cellulose with special reference to cotton and cotton fabrics' was presented at the Second Symposium on Cellulose Research organised by the Council of Scientific and Industrial Research held at Dehra Dun in February-March 1958.

16. Samples from agronomic trials have been received and are being tested for finding the effect of the various factors on fibre-properties.

17. The Spencer Refractometer which has been obtained recently has been put into operation and the refractive indices of various liquids to be used to determine the birefringence of cotton fibres have been estimated. Preliminary experiments are being carried out.

18. The Instron Tensile Strength Tester recently obtained as a gift to the Laboratory under the T.C.M. Programme of the U.S.A., is being put to test.



19. A method has been devised for determining the rigidity of cotton fibre bundles. Comparative tests of rigidity of single fibres and bundles of fibres are in progress.

*C. Investigations on fibre-properties and yarn-characteristics :*

20. A paper on 'The relationship between the single thread strength irregularity and the chief fibre-properties' was prepared and read before the All India Cotton Spinners', Breeders' and Ginners' Conference held at Bombay in July 1957.

21. A study was undertaken to determine the relationship between the irregularity, draft and hank number of a fibrous strand at the successive stages of spinning with a view to arrive at the optimum drafts to be employed at the various frames.

22. Statistical analysis of the results of tests obtained for the prediction of the spinning values of irrigated cottons from their chief fibre-properties were in progress.

23. The yarns from samples for the investigation on the performance of mixings of Indian cottons with special reference to their fibre properties were tested. The results are under examination.

24. Tests were carried out to investigate the effects of fibre properties on yarn-evenness and a paper based on the results obtained was read at the All India Textile Association Conference held in January 1958 at Bombay.

*D. Investigations on spinning and yarn-characteristics.—*

25. All parts for the construction of a small hand-operated card for (i) measuring the nep-potential of a sample of cotton, (ii) opening small samples of lint for Micronaire tests and (iii) preparing a good sliver for hand-spinning were fabricated and preliminary tests on this newly-designed card were carried out during the period.

26. A paper on the study of the variation of the irregularity of a fibrous strand at different stages of processing from card to ring frame entitled 'Evenness of material at different stages of processing, was prepared and read at the All India Cotton Spinner's, Breeder's and Ginner's Conference held at Bombay in July, 1957.

27. With a view to find out whether some long staple Indian cottons could serve the purpose of East African cottons by combing them to a certain extent, combing tests were carried out on the two varieties, P.A. 320 F and 170-Co 2 and their combed yarns were compared with the carded yarns of East African A.R.B.P. 52. It was found that combed 170 Co 2 compared somewhat favourably with carded A.R.B.P. 52.

28. A paper on the further work carried out with the micro-sample spinning technique on 14s, 20s, 30s and 40s yarns was published in the October 1957 issue of the Indian Cotton Growing Review. Another paper on the 'Assessment of spinning value of cotton by spinning a small sample' was prepared and read before the 8th Conference on Cotton Growing Problems in India held at Coimbatore in December 1957.

29. A study is being made of the variation in yarn-strength and in yarn-count in different portions of the bobbin.

*E. Chemical Problems.—*

30. With regard to maturity determination by differential dyeing method evolved at the Laboratory, trial tests made in the Breeding Stations had shown that more practice was necessary both in the dyeing and in visual estimation for the successful application of the technique. A paper on this problem was prepared and read before the 8th Conference on Cotton Growing Problems in India held at Coimbatore in December 1957.

31. A Cannon-Fenske Viscometer was set up for measuring viscosities of cupri-ethylene diamine solutions of cotton fibres at different pressures in an atmosphere of nitrogen to evaluate the D.P. of cotton fibres. D.P. Tests on samples of cotton grown under different climatic and soil conditions were carried out and some variations were found under certain conditions.

32. A paper on 'Decrystallisation of cotton cellulose' was presented at the Second Symposium on Cellulose Research organised by the Council of Scientific and Industrial Research held at Dehra-Dun in February-March 1958.

33. The oil contents of about 50 cotton seed samples of 1956 season and about 160 seed samples of 1957 season were estimated and the reports were sent to the respective Breeding Stations.

*F. Miscellaneous.—*

34. At the instance of the Agricultural Marketing Adviser to the Government of India, tests were undertaken for collecting data to provide an idea of the range of variation in the staple characters and trash content. 184 cotton samples of Vijalpa grown in different parts of Gujarat were tested and a Report sent to the Government of India.

35. Studies in the reduction of neps in the standard cottons are being continued. Two papers on the subject were communicated and read at the All India Spinner's, Breeder's and Ginner's Conference held in Bombay in July 1957 and the 8th Conference on Cotton Growing Problems in India held in December 1957 at Coimbatore.

36. An investigation was completed on behalf of the Bombay Millowners Association for the purpose of finding out the normal moisture content or regain for cotton lint, yarn and fabric. It was found that the international standard of  $8\frac{1}{2}$  per cent regain held good for Indian cotton lint, but it was  $7\frac{1}{2}$  per cent in the case of cotton yarns and fabrics. This is an important finding for use in commercial practice.

37. A full paper entitled 'A comparison of different methods of testing by the Shirley Analyser' was written up. It was found that there was no need to adopt the elaborate I.S.O. procedure which is long and time-consuming for these tests.

38. A paper on 'Defects in some of the superior long stapled cottons of India and some remedial measures' was read before the All India Cotton Spinner's, Breeder's and Ginner's Conference held at Bombay in July, 1957.

39. A paper on 'Comparative mill and Laboratory tests on improved varieties and trade varieties of Indian cottons' was read before the Eighth Conference on Cotton Growing Problems in India held at Coimbatore in December, 1957.

40. The test results for standard cottons which were being tested at the Laboratory since its inception 33 years ago were analysed and a paper, 'Whether the standard cottons have deteriorated in quality' was read before the All India Cotton Spinner's, Breeder's and Ginner's Conference held at Bombay in July, 1957.

41. Results obtained for the two sets of samples, one on standard cottons and the other on trade varieties for the 5 seasons, 1951-56 were analysed and a paper entitled 'What is the difference between the standard cotton and the corresponding trade variety' was presented before the All India Cotton Spinner's, Breeder's and Ginner's Conference, held at Bombay in July, 1957.

42. A study of the results obtained for the samples of improved varieties from distributed seed, at various stages of multiplication for the 7 seasons, 1950-57 was made and a paper 'Does the quality of cotton deteriorate with different stages of multiplication' was read before the All India Cotton Spinner's, Breeder's and Ginner's Conference held at Bombay in July, 1957.

*Publications.*—Besides the work described above, several technological bulletins, circulars, leaflets and articles were published during the year.

## VIII. MISCELLANEOUS

### (i) *Visitors.*

As usual, a large number of distinguished persons and students from Technological Colleges and Institutions visited the Laboratory during the period under review and among them mention may be made of the following :—

1. Mr. Hideaki Miyamoto (Japan)      F.A.O. Gear Technologist, Central Fisheries Technological Station, Cochin, S. I.

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|-----------------------------------|--|
| 2. Mr. George McKenzie (Scotland) | F.A. O.I.A., Fleet Manager, Govt. of India, Botawala Chambers, Sir P. M. Road, Bombay.                         |
| 3. Mr. A. J. George               | ... Deputy Director of Fisheries, Central Deep Sea Fishing Station, Botawala Chambers, Sir P. M. Road, Bombay. |
| 4. Mr. A. F. D'Mello              | ... Fisheries Technologist, Govt. of India, Cold Storage, Sassoon Dock, Colaba, Bombay.                        |
| 5. Shri Madan Mohan Ruia          | ... Vice-President, Indian Central Cotton Committee, Fort, Bombay 1.   |
| 6. Shri S. R. Dongerkery          | ... Rector, University of Bombay.  |
| 7. Prof. B. B. Deshpande          | ... Professor of Physics, Ruparel College, Bombay 16.  |
| 8. Dr. G. M. Nabar                | ... Professor of Textile Chemistry, Department of Chemical Technology, Matunga, Bombay 19.                     |
| 9. Mr. Eudes DeSouza Leao Pinto   | ... Prof. of Genetics in the Rural University of Pernambeur, Brazil.   |
| 10. Mr. Ellis R. Ott.             | ... United Nations Technical Admn. Rutgers University, New Brunswick, N. J.                                    |
| 11. Shri D. V. Chauhan            | ... Deputy Minister of Agriculture, Bombay State.  |
| 12. Shri K. R. Kanade             | ... Superintendent, Khadi Production Centre, Ausa.   |
| 13. Dr. Helmut Wakeham            | ... T. C. M. Advisor to the Director, The Ahmedabad Textile Industry's Research Association, Ahmedabad.        |
| 14. Mr. V. A. Churikov            | } Leader and members of the U.S.S.R. Farmer's Delegation to India.   |
| 15. Mr. A. Kuchkarov              |  |
| 16. Mr. G. A. Zoberko             |  |
| 17. Mr. A. V. Chukno              |  |

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|-----|----------------------------------|-----|--|
| 18. | Mr. R. N. Davies                 | ... | Director of African Agriculture, Southern Rhodesia.  |
| 19. | Prof. David V. Ter Avanesyan     | ... | Director, Biological Sciences, Counsellor of Agricultural Affairs, Embassy of the U.S.S.R. |
| 20. | Shri <sup>r</sup> Mustafa Zabadi | ... | Chief Advisor for Agriculture, Govt. of Iraq.  |
| 21. | Dr. A. J. Turner,                | ... | Founder Director of the Technological Laboratory.  |
| 22. | Shri Ajit Prasad Jain            | ... | Minister for Food & Agriculture, Govt. of India, New Delhi.                                |
| 23. | Dr. P. V. Nair                   | ... | Director of Industries, Kerala State.  |
| 24. | Prof. Dr. Ing. Dischka           | ... | Head of the Hungarian Textile Research Institute, Budapest.                                |

(ii) *Staff — (a) Officers.*

Shri S. M. Betrabet was appointed as Junior Research Officer with effect from the 15th June, 1957.

The post of Statistician was converted to Junior Research Officer (Statistical) and Shri V. Venkataraman was appointed to it with effect from the 17th June, 1957.

Shri V. V. Gupte, Spinning Master, proceeded on leave from 13-8-1957 to 28-9-1957 and again from 12-5-58 to 24-5-58.

Dr. V. Sundaram, Junior Research Officer, was appointed as Officiating Senior Research Officer, vice Dr. R. L. N. Iyengar with effect from the 13th September, 1957.

Shri K. G. Deo, Senior Assistant (Technological) Dharwar, was appointed as Superintendent, Testing House, with effect from the 25th November, 1957.

Shri Harirao Navkal, Senior Research Officer, proceeded on leave from the 13th January 1958 to 7th March 1958 and from 15th March, 1958 to 31st May, 1958.

Shri N. Balasubramanian, Research Scholar, was appointed as Officiating Junior Research Officer with effect from the 5th March, 1958, after completion of his training for a period of two years.

Dr. A. N. Gulati, Senior Research Officer, retired from service with effect from the 1st April, 1958.

(b) *Establishment.*

Shri P. S. Sambamurthy was transferred to Coimbatore as Senior Assistant (Technological) on 18-10-1957.

Shri N. C. Chiplunkar was transferred to Indore as Senior Assistant (Technological) on 12-11-1957.

Shri M. S. Sitaramaiah was transferred to Dharwar as Senior Assistant (Technological) on 24-11-1957.

The two posts of Head Assistants (Testing) newly created were filled up by Sarvashri V. N. Modak and K. V. N. Nayar.

Sarvashri J. M. Shah and S. Ramanathan, Junior Assistants (Testing) were promoted to the posts of Senior Assistants (Testing) *vice* Sarvashri Sambamurthy and Modak respectively.

Sarvashri A. N. Balasubramaniam, V. M. Kamath, P. N. Elayathu, C. K. Ramachandran, B. L. Lalwani, A. W. Shringarpure and S. R. Ganatra were appointed as Junior Assistants (Testing) *vice* Sarvashri L. R. Jambuanthan, J. M. Shah Miss I. G. Bhatt, S. K. Iyer, N. C. Chiplunkar, M. S. Seetharamiah and M. Radhakrishnan respectively.

Shri P. D. Ghangurde was appointed as Senior Assistant (Statistical) with effect from the 1st July, 1957.

Shri S. G. Nayar was appointed as Junior Assistant (Statistical) with effect from the 2nd September, 1957.

Sarvashri P. B. Joshi and T. S. Jagannath, 2nd Spinning Assistants resigned and these vacancies were filled by Sarvashri M. S. Bhawsar and S. A. Shankarnarayan with effect from 2-9-1957 and 7-5-1958 respectively.

Shri U. J. Kini, Senior Clerk (Accounts) resigned and in his place Shri V. P. Shendye was appointed with effect from 21-8-1957.

Shri Rashid Sheikh Abdulla was appointed as Gin Fitter from 2nd September, 1957.

It is with profound regret that I have to record the death of Shri M. T. Majmudar, Office Superintendent, on the 1st October, 1957. He rendered signal service to the Laboratory during the long period of service of about 30 years being in charge of all sections of the Office of the Laboratory.

Shri A. T. Raphael, Cashier & Accountant in the office of the Secretary, Indian Central Cotton Committee, was appointed as Office Superintendent, with effect from the 2nd January, 1958.

Shri P. V. Srinivasan, Stenographer, was appointed as Accountant in the Office of the Secretary, Indian Central Cotton Committee with effect from the 2nd January, 1958. Shri K. S. Parameswaran was appointed as Stenographer *vice* Shri P. V. Srinivasan.

Shri R. T. Bhat, Storekeeper proceeded on leave from the 1st March, 1958 prior to resignation and this vacancy was filled by the promotion of Shri S. K. Redkar, Stores Clerk. Shri V. D. Ponkshe was appointed as Stores Clerk *vice* Shri Redkar with effect from the 4th March, 1958.

(iii) The following additional equipment was added to the Laboratory.

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|---|---------------------------|
| 1. Refractometer                                    | Under T. C. M. Programme. |
| 2. Devilbiss Air compressing outfit — Type UBT-5002 |                           |
| 3. Stelometer Model 154                             |                           |
| 4. Eco American Make Gearless Pump.                 |                           |
| 5. 'Instron' Tensile Testing Instrument             | Under T. C. M. Programme  |
| 6. Balls Magazine Hair Tester.                      |                           |

(iv) *Students selected for Training in Cotton Technology.*

As in the past, the following students were selected for training in the elements of spinning and methods of testing fibres, yarn and cloth and application of statistical methods to textiles for a period of six months commencing from the 14th January, 1957 :—

1. Shri Chandra Prakash Modi, (Messrs. Modi Spg. & Wvg. Mills Co. Ltd., Modinagar).
2. Shri N. A. Bhogale, (Messrs. Tata Mills Ltd., Dadar, Bombay).
3. Shri V. U. Kulkarni, (Messrs. Kohinoor Mills Co. Ltd., Bombay).
4. Shri Chandrakant Ramanlal Gandhi, (Messrs. Shri Vivekanand Mills Ltd., Ahmedabad).
5. Shri C. P. M. Swamidass, (Messrs. Madura Mills Co. Ltd., Madurai)
6. Shri Dali M. Lall.

(v) Two post-graduate students of Indian Agricultural Research Institute, Delhi, were given facilities for carrying out the technological portion of their programme of research work. They are (1) K. K. Murthy and (2) D. N. Puri.

(vi) *Exhibitions.*—The Laboratory Gin and Ginning Percentage Balance designed at the Laboratory and Baer Sorter patterns and halo cards prepared by the Laboratory were displayed at the Agricultural and Rural Industries Exhibition held at New Delhi in March, 1958.

(vii) *Other Activities.*

- (1) A short course of training in ginning for the personnel of ginning factories is being conducted in the Laboratory annually. A batch of five gin fitters was given this training in May, 1958.
- (2) The First All India Cotton Spinners', Breeders' and Ginners' Conference was held on the 20th and 22nd July, 1957, at the Committee's Hall of the Indian Central Cotton Committee Office under the Chairmanship of Shri Madanmohan R. Ruia, Vice-President of the Indian Central Cotton Committee. There was one symposium on the improvement effected in quality of Indian cottons and measures to be adopted for further improvement and another on ginning. In addition, a number of papers on Cotton Growing, Cotton Technology and Cotton Ginning were also discussed.
- (3) The Eighth Conference on Cotton Growing Problems in India was held at Coimbatore in December, 1957 and the Senior Officers of the Laboratory attended the Conference. Eight papers contributed by the staff of the Laboratory were read and discussed at the Seminar dealing with "Recent Advances in cotton technology and their bearing on cotton breeding in India".
- (4) Shri K. S. Bhujang and Dr. V. Sundaram, Senior Research Officers, and Dr. S. M. Betrabet, Junior Research Officer, attended and took part in the discussion at the 2nd Symposium on Cellulose Research arranged by the Cellulose Research Committee of the Council of Scientific and Industrial Research held at Dehra Dun on the 27th and 28th of February and on the 1st of March, 1958. A paper on "Effect of cellulose structural differences on tensile properties of cotton" by Dr. Sundaram was read at the Symposium. Two schemes entitled "Studies in the changes effected by specific reagents on the crystallinity of the cotton fibres and their relation to some of the fibre properties" and "Microbial decomposition of cellulose with special reference to cotton and cotton fabrics" were presented by Shri Bhujang and Dr. Betrabet respectively at the meetings of the Cellulose Research Committee and were discussed. The first scheme was subsequently approved by the Council of Scientific and Industrial Research and will be undertaken at the Laboratory after the approval of the Indian Central Cotton Committee. As regards the second scheme, it was suggested that it should be suitably modified taking into accounts the work already done at the Kanpur Defence Laboratories.
- (5) Shri N. Balasubramaniam contributed a paper entitled 'The causes of irregularity of cotton yarns — the importance of fibre length irregularity' to the All India Textile Association Conference held in January 1958 at Bombay.
- (6) The Laboratory was recognized by the Bombay University as a Post-Graduate Institution for the purpose of guiding students for the M.Sc. Degree by research in Textile Physics. So far three students have registered their names.



(7) *Staff Research Council.*—Ten meetings of the Staff Research Council were held since its inauguration by the Vice-President of the Indian Central Cotton Committee on 22nd February, 1957. Programme of work of the Laboratory, progress made on research problems, change-over to metric system, etc., were discussed in some of these meetings, Advantage was taken of the presence of eminent persons like Mr. T. L. Bailey of the U.S.D.A. and Dr. A. B. Joshi of the I.A.R.I. and problems of mutual interest were discussed and these discussions were extremely beneficial to the members of the Council. Two subjects, (1) Generation and elimination of static electricity in textile processing by Shri Jai Prakash and (2) The arrangement of fibres in yarn by Shri N. Balasubramaniam were presented by the authors and discussed in one of these meetings.

Dr. A. James Turner, the Founder Director of the Laboratory delivered a valuable and instructive address to the members of the staff. Dr. Ellis R. Ott of the UNTAA and Prof. Dr. Ing. Dischke, Head of the Hungarian Textile Research Institute, Budapest also addressed the members.

(8) *Lectures.*—The following lectures were delivered during the period under review:—

(1) "The ways and means of improving the quality of cotton" by Dr. R. L. N. Iyengar, on the 17th August 1957, under the auspices of the Textile Institute, (Bombay Branch) at the auditorium of the Department of Chemical Technology, Matunga.

(2) "Selection of Indian cotton in relation to fibre properties" by Dr. R. L. N. Iyengar, on the 26th July, 1957, under the auspices of the Ahmedabad Textile Industry's Research Association, Ahmedabad.

(3) Some aspects of the quality of cotton by Dr. R. L. N. Iyengar, on the 22nd August, 1957, being inaugural address to the Degree Student's Association of the V. J. T. Institute for the year 1957-58.

(4) "Relationship between Fibre Properties and Yarn Quality" by Dr. R. L. N. Iyengar, on the 5th December, 1957, under the auspices of the South India Textile Research Association, Coimbatore.

(9) *Change-over to Metric system.*—The change-over to metric system, as it affects the Technological Laboratory, was under consideration for quite some time. Additional columns or separate tables are being provided in the annual publications of the Laboratory. Similarly, additional columns for the metric units were provided in the tables of spinning, fibre, yarn and cloth test reports when the forms were recently printed. Thus, all results emanating from the Laboratory are at present given in both units. Conversion formulae for each property from the English to the C. G. S. units have been worked out for use in this connection. Arrangements are being made to calibrate the existing equipment, apparatus, balances, etc., in the metric system wherever necessary.

(10) *Fabrication*:—Several instruments were fabricated locally, tested and supplied to various Laboratories, Institutions, etc., during this year. Of these, mention may be made of the following instruments:—

1. Laboratory Gins ( 4 Nos. )
2. Ginning Percentage Balance ( 2 Nos. )
3. A.N. Stapling Apparatus ( 1 No. )
4. Laboratory Strength Tester ( 2 Nos. )

#### ACKNOWLEDGMENTS.

I take this opportunity to express my gratitude and deep indebtedness to the office-bearers of the Indian Central Cotton Committee for their keen interest in the work of the Laboratory and for the valuable suggestions thereon. My grateful thanks are due to the East India Cotton Association Ltd., Bombay and their Sworn Surveyors for kindly grading a very large number of experimental, trade, standard and technological samples of cotton.

My thanks are also due to the authorities of the various mills, for their valuable help in carrying out mill tests on a large number of improved varieties of cotton, which has proved useful to the Committee for assessing the performance of the new varieties under mill conditions.

I also wish to place on record my sincere thanks to the technical and administrative staff of the Laboratory for their willing and loyal co-operation, without which the work described in the present report could not have been accomplished.

R. L. N. IYENGAR,  
*Director,*  
*Technological Laboratory*

30th June, 1958.

## APPENDIX I

*Brief account of the Technological work done at the Cotton Breeding Stations in India during the year ended 31-3-58.*

Details regarding the staff, the number of samples tested during the year and the nature of the tests carried out are given below.

Cotton Breeding Station at	Staff		No. of samples tested for			
	Senior Assistant (Technological)	Junior Assistant (Technological)	Fibre-length	Fibre-weight	Fibre-maturity	Strength Index
Abohar	Shri N. Geo. Paul	.....	363	150	152	776*
Bulandshahr	Shri M. Radha Krishnan,	.....	919†	266	87	50
Coimbatore	Shri K. S. Marar (1-4-57 to 31-10-57)	Shri S. K. Iyer	522	444	384	391
	Shri P. S. Sambamurthy (1-11-57 to 31-3-58)					
Dharwar	Shri K. G. Deo (1-4-57 to 16-11-57)	Shri Y. R. Yardi	1,139**	1,139	15	49
	Shri M. S. Sitharamiah (for the rest of the year)	Shri E. S. Abraham (Temporary)				
Indore	Shri K. V. N. Nayar (1-4-57 to 17-11-57)	Shri W. R. Sharma	682‡	695	441	406
	Shri N. C. Chiplonkar (18-11-57 to 31-3-58)	Shri N. B. Joshi (5 months)				
Nagpur	Shri L. R. Jambunathan	.....	288	288	372	358§
Nanded	Shri H. R. Nayak	.....	424	424	...	214
Shoranur	Shri K. S. Marar¶	.....	...	...	...	65
Surat	Shri M. U. Parmar	Shri R. G. Sanklia	775	660	60	...

\* 600 seeds have been tested for embryo and seed weights, and 904 halo-length measurements have been made.

† Out of these, 777 samples have been tested by using 2 tufts.

\*\* Fibre-length irregularity has been calculated for all these samples.

‡ Fibre-length irregularity has been calculated for 370 samples.

§ 174 seeds have been tested for embryo and seed weights.

¶ Shri K. S. Marar set up the fibre-testing laboratory at this station which was newly opened. He worked there only for about a month during the period under review.

The Senior Assistants (Technological) are mainly engaged in the testing of fibre-properties of various strains evolved in connection with the breeding work of the experimental stations. A summary of the work done by them during the year is given below.

#### *Abohar.*

The Desi Crosses are long but very coarse and hence, they are likely to spin to a lower count than what could be expected of them from a consideration of only their mean fibre-lengths.

The results for the LL strains are very disappointing at all the stations during this year. On an average, the mean fibre length of the LL strains (at Abohar) has

decreased by more than 10%. This has been ascribed to strong dry winds. If the diminution in length continues next year, the reasons for this have to be investigated properly.

Selections on the basis of high Pressley strength index are being continued.

Several seed and fibre-characters of long-linted strains have been determined in order to study their inter-relationships. Within the seeds of the same plants, the embryo weight is found to be slightly correlated with the halo-length and Pressley strength index and more highly correlated with the seed weight. As longer and finer cottons spin better than the shorter and coarser ones, it might be inferred that there is some association between the weight of the seed and the strength of yarns obtained by spinning its lint.

Two papers embodying the results of the investigations mentioned in the last two paragraphs have been read before the Eighth Conference on Cotton Growing Problems in India.

#### *Bulandshahr.*

A study of several single plants belonging to various types indicate the possibility of increasing the length of the regional *arboreums* to 1". Many *hirsutum* plants have yielded fibres about 1.10" long.

Properties of seeds which are nep-prone and those which have showed no damage have been measured. The lint-index of the seed-coatnep-prone seed is found to be higher and its produce coarser. The mean fibre-length as well as the seed weight is the same for both the types of seeds. Hence, it is stated that a straight selection for low chalazal damage may lead to a deterioration in the lint-index. A paper containing these points was read at the 8th Conference on Cotton Growing Problems in India.

An experiment was carried out on 7 *hirsutum* strains which were sown on the 24th of April as well as on the 30th of May. Whereas there is practically no difference between the seed-weights of the April and May sown samples, the lint index (and consequently, the ginning percentage) for the former is noticed to be higher; this is due to a certain extent (a) to the higher unit fibre-weight and (b) to an increase in the number of fibres per seed. The date of sowing has been found to have no effect on either the mean fibre-length or the spinning value.

It is stated that the increase in yield as well as the higher unit fibre-weight may be attributed, partially at least, to the longer growing season. These preliminary findings were embodied in a paper read at the All India Cotton Spinners', Breeders' and Ginners' Conference held at Bombay.

#### *Coimbatore.*

Lo 603 F grown at Srivilliputtur is found to be 1.11" long with a Pressley Strength Index as high as 8.5 lb./mg.; it contains nearly 70% of mature fibres.

A. C. 79 and L. L. 55 (both nearly an inch in length) have been grown in the Rice Fallows Scheme at Aduthurai ; they possess a strength-Index of 8.98 and 8.26 respectively. Several wild hybrids have been tested and their properties are found to be interesting.

A paper entitled "Recent Advances in Cotton Technology and their bearing, on Cotton Breeding in India — Notes on" was placed before the 8th Conference on Cotton Growing Problems in India.

Weekly pickings of 6186-9 and K.2 were examined. It was found that (a) the fibre-length deteriorated after the 4th or 5th week, (b) K. 2 became progressively finer after the first few weeks, whereas 6186-9 showed no change and (c) there was no appreciable decrease in maturity till the last week was reached.

As a result of sowing date experiment on MCU 2 conducted at Bhavanisagar, it has been concluded that the last week of September or the first week of October is favourable for sowing. The sample sown later showed a decrease in length, the fibre-weight per unit length and maturity showing no change.

A spacing experiment on 9030 G was conducted at Avanashi with 3 spacings (1 1/2', 2' and 2 1/2') between rows and 2 spacings between plants (6" and 9") both with single and double plants per hole. The double plants recorded higher yields than the single plants. No appreciable change was noticed in the fibre-characters (length, weight per inch, maturity and Pressley strength) with different spacings.

#### *Dharwar.*

In an experiment to increase the yield, seeds have been soaked in water or treated with chemicals like Formaldehyde, etc. ; it is noticed that these treatments do not change the fibre-properties very much.

Some of the perennials are found to be satisfactory from the point of view of both the mean fibre-length and the fibre-weight per unit length.

An investigation is being carried out to study the effect of locality, sowing dates and manures on the fibre-characters of Jayadhar and Laxmi.

#### *Indore.*

In the preliminary observation trials, some interesting interspecific hybrids (1.04 to 1.17" long) have been grown at Badnawar. On the whole, the C. T. I. hybrids are found to be stronger than the others, some of them possessing a strength-index as high as 8.7 to 8.9 lbs/mg.

Some promising long American strains have been evolved which would be suitable for the Mewar region.

A paper entitled "Recent advances in Cotton Technology and their bearing on cotton breeding in India" was read at the Eighth Conference on Cotton Growing Problems in India.

An experiment has been designed to study the yield and fibre-characters with increasing doses of nitrogen on both the American and Desi cottons. It is noticed that whereas the yield increased as heavier and heavier doses of nitrogen were applied (upto 90 lbs. of N), neither the ginning percentage nor the fibre-properties (length and fineness) was affected.

Fibre-properties are being determined to study whether they show any change when nitrogen is applied in four different organic forms.

*Nagpur.*

A number of pure line selections of B. 147 and a few Buri strains grown at this station are found to be remarkably long (1 1/16"); the maturity coefficient is high and the strength Index (lb./mg.) ranges from 6.8 to 8.1. The strain 0382 has been crossed with Giza 7. This cross (F<sub>1</sub>) is 1 1/4" long and possesses a fibre-weight as low as  $0.084 \times 10^{-6}$  oz./in inspite of its containing 75% mature fibres; it is not, however, strong.

A paper entitled "The recent work on neppiness in cotton — how the Breeder can help in tackling the problem" was placed before the 8th Conference on Cotton Growing Problems in India.

As a result of testing 3 pickings of 7 varieties, it is concluded that whereas all the pickings of the same variety are equally fine and equally mature, the mean fibre-length is higher and the Pressley strength index lower for the first picking than for the second. The third picking contains weak fibres.

From a study of 4 *arboreum* and 4 *hirsutum* strains it has been found (between the seeds of the same plant) that the embryo-weight is associated with the maturity coefficient to a certain extent ( $r = +0.5$ ) and is more highly correlated ( $r = +0.87$ ) with the seed weight. The embryo-weight is not related to the Pressley strength index for the *hirsutum* strains; but this relationship is more marked ( $r = -0.3$ ), but still feeble, for the *arboreum* strains. Incidentally, it is noticed, that no relationship exists between maturity coefficient and the strength index. These conclusions however, have to be confirmed by an examination of these results for two or more following seasons.

*Nanded.*

Three strains obtained at Nanded possess a mean fibre-length as high as 1.10" with a low fibre-weight per unit length.

The effects of town compost, farm yard manure, ammonium sulphate and some combination of these manures have been studied on the fibre-properties of

Gaorani 6. It has been concluded provisionally that the nature of the manure does not affect the fibre-properties to any great extent.

A paper dealing with this subject was read before the Eighth Conference on Cotton Growing Problems in India.

Fibre-properties of Gaorani 6 and Gaorani 6E-3 have been determined when they are grown with 3 different spacings (12", 18" and 24"); and no appreciable change in the fibre-characters is noticed when the spacing is changed.

A rotational experiment is being conducted at the Cotton Research Station at Nanded. From the results obtained it has been tentatively concluded that any change in the rotational treatment does not affect the fibre-properties, either favourably or adversely. This experiment will be continued for a few more seasons.

#### *Shoranur.*

The fibre-testing Laboratory at this station was set up under the Sea Island Development Scheme.

The produce of those single plants of Sea-Island (Andrews) cotton which gave a high yield and high ginning percentage were tested for the Pressley strength index with a view to select good plants which were satisfactory from a consideration of the characters studied. This work will be continued next year when the progenies of these plants will be examined.

#### *Surat.*

In the *herbaceum* tract, the synthetic culture, (2087 × 2334) F-198, has been found to be very satisfactory. Some of the new strains grown under the Indo-American Cotton Breeding Scheme have been found to vary in length from 1.12" to 1.21". Some outstanding secondary selections have been made from 170 Co. 2 at Junagadh.

A paper entitled "A note on the anomalous spinning performance of Indo-American types" was read at the Eighth Cotton Growing Conference held at Coimbatore.

The Indo-American strains, 170-Co.2 and 68 × 22, along with various controls have been grown in different places scattered over Gujarat. They are being studied for their fibre-properties with a view to see whether they differ in different localities and if so, whether these changes could be explained from a consideration of the conditions of the soil and climatic factors.

As a result of a spacing experiment that has been carried out, it has been concluded that the mean fibre-length is unaltered, when spacing is changed.

## APPENDIX II

The following publications were issued from the Laboratory during the period under review :—

I. *Technological Bulletin Series 'A'*.

- (i) Technological Bulletin Series A No. 94. Effects of Storage of Baled Indian Cottons at Bombay and at their respective Growth Centres on the Lint Quality, by C. Nanjundayya, M.Sc., Ph.D. (Manch.), F.T.I. and V. Venkataraman, M.A.
- (ii) Technological Bulletin Series A No. 95. Technological Reports on Standard Indian Cottons, 1957 by R. L. N. Iyengar, D.Sc.
- (iii) Technological Bulletin Series A, No. 96. Technological Reports on Trade Varieties of Indian Cottons 1957, by R. L. N. Iyengar, D.Sc.

II. *Technological Bulletin Series 'B'*.

- (i) Technological Bulletin Series B No. 55. A comparative study of the Commercial and Laboratory valuations of the cotton lint produced with cleaning before and after ginning, by C. Nanjundayya, M.Sc., Ph.D. (Manch.), F.T.I. and R. L. N. Iyengar, D.Sc.
- (ii) Technological Bulletin Series B. No. 56. A review of the studies on the relationships between the spinning values and the chief fibre properties of a cotton by C. Nanjundayya, M.Sc., Ph.D. (Manch.), F.T.I. and Harirao Navkal, M.Sc.
- (iii) Technological Bulletin Series B No. 57. Relationship between the single thread strength and the chief fibre properties by Harirao Navkal, M.Sc.
- (iv) Technological Bulletin Series B. No. 58. Further Spinning Tests on Micro-samples of cotton, by V. V. Gupte, B.Sc. (Tech.), Harirao Navkal M.Sc. and C. Nanjundayya, M.Sc., Ph.D. (Manch.), F.T.I.
- (v) Technological Bulletin Series B No. 59. Standardization of the Nep-counting Technique for cotton lint, by C. Nanjundayya, M.Sc., Ph.D. (Manch), F.T.I., R. L. N. Iyengar, D.Sc., Harirao Navkal, M.Sc. and S. Rajaraman, D.Sc.
- (vi) Technological Bulletin Series B No. 60. Degradation of Cotton during mechanical processing by K. S. Bhujang, M.Sc. (Tech.) and C. Nanjundayya, M.Sc., Ph.D. (Manch.), F.T.I.
- (vii) Technological Bulletin Series B No. 61. The relationship between the Micronaire reading and the fibre weight obtained by weighing whole fibres, by Harirao Navkal, M.Sc.



### III. *Technological Leaflets.*

- (i) Technological Leaflet No. 47. Pre-cleaning and ginning tests on Indian Cottons. (33) Tests on Gaorani-6 cotton (1953-54 season) by R. L. N. Iyengar, D.Sc.
- (ii) Technological Leaflet No. 48. Pre-cleaning and ginning tests on Indian Cottons. (34) Tests on Punjab American 320F cotton (1956-57 season) by R. L. N. Iyengar, D.Sc.
- (iii) Technological Leaflet No. 49. Pre-cleaning and ginning tests on Indian cottons. (35) Tests on Sea Island (Andrews) (1957-58) by R. L. N. Iyengar, D.Sc. and D. G. Shete, L.M.E.

### IV. *Articles and Papers.*

The following articles were published in the Indian Cotton Growing Review:-

- (i) A comparative study of the Commercial and Laboratory valuations of the cotton lint produced before and after ginning by C. Nanjundayya and R. L. N. Iyengar. I.C.G.R. July 1957. (B. 55)
- (ii) Relationship between the single thread strength and the chief fibre properties, by Harirao Navkal. I.C.G.R., October 1957 (B. 57)
- (iii) Further Spinning Tests on micro-samples of cotton by V. V. Gupte, Harirao Navkal and C. Nanjundayya. I.C.G.R. October 1957. (B.58)
- (iv) A study of the relationship between the fibrillar orientation determined by X-ray method and strength of the cotton fibre — by V. Sundaram and C. Nanjundayya. I.C.G.R. October 1957.
- (v) The relationship between the Micronaire readings and the fibre-weight obtained by weighing the whole fibres, by Harirao Navkal. I.C.G.R. March 1958 (B. 61)
- (vi) Design of a ballistic tester and experiments carried out with it on three types of materials by C. Nanjundayya and R. L. N. Iyengar. I.C.G.R. May 1958.

A paper entitled "The dynamic mechanical properties of high polymers and the importance of this study" by Shri Jai Prakash was sent for publication to the Indian Central Cotton Committee.

The following articles were published in various Journals as given below :—

- (i) Standardization of the Nep-counting Technique for cotton lint, by C. Nanjundayya, R. L. N. Iyengar, Harirao Navkal and S. Rajaraman. *The Indian Textile Journal*, Jan. 1958. P. 222-232. (B. 59)

- (ii) Degradation of cotton during mechanical processing, by K. S. Bhujang and C. Nanjundayya. *Journal of Scientific and Industrial Research*, 1958, P. 41-44. (B. 60)
- (iii) Balancing Quantity with Quality by R. L. N. Iyengar. *The Cotton Trade Journal*. 25th International Year Book 1957-58.
- (iv) Structural Features of cotton fibres as Revealed by Dye Absorption by K. S. Bhujang, *Colourage Annual Number*, August 1957.
- (v) Improvement of Indian Cotton, by R. L. N. Iyengar, *Dipika*, December 1957.

The following papers were contributed to the All India Cotton Spinners', Breeders' and Ginners' Conference :—

- (i) Symposium on the Improvement effected in quality of Indian Cottons and measures to be adopted for further Improvement: (a) Introduction by R. L. N. Iyengar. (b) 'Shortcomings in some of the superior long staple cottons of India and some remedial measures', by Harirao Navkal and R. L. N. Iyengar.
- (ii) Whether the standard cottons have deteriorated in quality by R. L. N. Iyengar.
- (iii) What is the difference between the standard cotton and the corresponding trade variety by V. Venkataraman and R. L. N. Iyengar.
- (iv) Does the quality of cotton deteriorate in the different stages of multiplication ? by R. L. N. Iyengar and V. Venkataraman.
- (v) Oil contents of different Indian cotton seeds by K. S. Bhujang and Indira G. Bhatt.
- (vi) Performance of Sea Island Andrews Cotton, by R. L. N. Iyengar.
- (vii) The relationships between the single thread strength irregularity percentage and the chief fibre properties — by Harirao Navkal.
- (viii) The Application of X-ray diffraction method for the evaluation of fibre quality, by V. Sundaram.
- (ix) Evenness of material at different stages of processing, by N. Balasubramanian and R. L. N. Iyengar.
- (x) The reduction of neppiness in Indian Cottons, by R. L. N. Iyengar and K. P. R. Pillay.
- (xi) Installation of delinters in the ginning factories by K. S. Bhujang.

The following papers were contributed to the Eighth Conference on Cotton Growing Problems in India held in Coimbatore during 4-8 December, 1957 :—

- (i) Recent Advances in Cotton Technology and their bearing on cotton breeding in India, by R. L. N. Iyengar.
- (ii) Comparative Mill and Laboratory tests on Improved varieties and trade varieties of Indian cottons by R. L. N. Iyengar and V. Venkataraman.
- (iii) A study of the variation of fibre maturity at different regions of the seed surface and of its variation from seed to seed in relation to the seed weight, by Jai Prakash and R. L. N. Iyengar.
- (iv) Reduction of neps in standard Indian cottons by R. L. N. Iyengar and K. P. R. Pillay.
- (v) Relationship between the fibre characters measured by the Fibrograph with similar characters obtained by Balls Sorter, by Harirao Navkal.
- (vi) Assessment of spinning value of cotton by spinning a small sample by V. V. Gupte.
- (vii) X-ray diffraction technique as an aid for assessing fibre quality in cotton breeding work, by V. Sundaram.
- (viii) A dyeing method for the determination of cotton fibre maturity, by K. S. Bhujang.

The following papers were contributed to the Symposium on Cellulose Research held under the auspices of Council of Scientific and Industrial Research, New Delhi at Dehra Dun during February 1958 :—

- (i) De-crystallisation of cotton cellulose (Review of the work done so far and further scope), By K. S. Bhujang.
- (ii) Effect of cellulose structural differences on tensile properties of cotton by V. Sundaram.
- (iii) Microbial decomposition of cellulose with special reference to cotton and textile fabrics by S. M. Betrabet.

The following paper was contributed to the symposium on selecting, blending, opening and cleaning of cotton, conducted by ATIRA, Ahmedabad in July 1957 :—

“Selection of Indian Cottons in Relation to Fibre properties,” by R. L. N. Iyengar.

An article entitled “A brief account of Technological Research on Cotton in India”, by R. L. N. Iyengar, was sent for publication in the “Herald of Science” U.S.S.R.

The following article was contributed for publication in the “Directory-cum-Year Book 1958” of Textile Industries, New Delhi, Textile Brotherhood Organisation :—

‘Need for scientific testing for quality of raw produce and the finished product,’ by R. L. N. Iyengar.

The following papers were sent for publication during the period under review :—

- (i) Pectin and wax contents and their relationship to the physical characters of cotton by R. Narayana Rao, K. S. Bhujang and C. Nanjundayya, Journal of Scientific and Industrial Research, New Delhi.
- (ii) An apparatus for the measurement of frictional force between cotton fibres and a study of the relationship between frictional force and some fibre properties,’ by C. Nanjundayya, Journal of Scientific and Industrial Research, New Delhi.
- (iii) ‘Effects of different processing treatments given to M. A. 5 cotton in regard to nep-formation,’ by R. L. N. Iyengar and C. Nanjundayya, Indian Textile Journal.

These papers after publication will be reprinted as Technological Bulletins of Series B of the Laboratory.

The following paper was contributed to the All India Textile Conference held in Bombay during January 1958 :—

‘The causes of irregularity of cotton yarns—the importance of fibre length irregularity,’ by N. Balasubramanian.

V. *Technological Circular Nos. 1049 to 1080 as per list given below :—*

Techno-logical Circular No.	Title	Date of publication
1049	Spinning Test Report (No. 4815) on samples of Surat cotton, 1956-57.	July 1957
1050	Spinning Test Report (No. 4816) on samples of Vijalpa (2087) cotton, 1956-57.	Aug. 1957
1051	Spinning Test Report (No. 4817) on a sample of Digvijay cotton 1956-57	Aug. 1957
1052	Spinning Test Report (No. 4818) on samples of Gaorani 6 cotton 1956-57	Aug. 1957
1053	Spinning Test Report (No. 4819) on samples of Navsari cotton, 1956-57	Aug. 1957
1054	Spinning Test Report (No. 4828) on samples of Kalyan cotton, 1956-57.	Aug. 1957
1055	Spinning Test Report (No. 4829) on samples of Wagad (Saurashtra) cotton, 1956-57	Aug. 1957
1056	Spinning Test Report (No. 4830) on samples of Jayadhar (Hubli) cotton, 1956-57	Aug. 1957
1057	Technological Report on samples of Virnar (197-3) cotton, 1956-57	Aug. 1957
1058	Spinning Test Report (No. 4848) on samples of Jayadhar (Bagalkot) cotton, 1956-57	Sept. 1957
1059	Spinning Test Report (No. 4849) on samples of Jayadhar (Bijapur) cotton, 1956-57	Sept. 1957
1060	Spinning Test Report No. 4857 on samples of Laxmi (Gadag) cotton, 1956-57	Sept. 1957
1061	Spinning Test Report (No. 4852) on samples of Jayadhar (Bailhongal) cotton, 1956-57	Sept. 1957
1062	Technological Report on samples of Gaorani 12 cotton, 1956-57	Sept. 1957
1063	Spinning Test Report (No. 4866) on samples of K. 2 Sattur cotton, 1956-57	Sept. 1957
1064	Spinning Test Report (No. 4867) on samples of Tinnevelly cotton, 1956-57	Sept. 1957

Techno- logical Circ lar No.	Title	Date of publication
1065	Spinning Test Report (No. 4868) on samples of Karunganni 5 (Coimbatore) cotton, 1956-57	Sept. 1957
1066	Spinning Test Report (No. 4872) on samples of A.R.B.P. 52 cotton, 1957	Oct. 1957
1067	Spinning Test Report (No. 4873) on samples of A. R. Busoga cotton, 1957	Oct. 1957
1068	Spinning Test Report No. 4874 on samples of A. R. Jinja cotton, 1957	Oct. 1957
1069	Technological Report on samples of Vijalpa (2087) cotton, 1956-57	Oct. 1957
1070	Spinning Test Report (No. 4896) on samples of Farm Westerns (Bellary) cotton, 1956-57	Nov. 1957
1071	Technological Report on samples of Jayadhar cotton, 1956-57	Nov. 1957
1072	Technological Report on samples of Gaorani 6 cotton, 1956-57	Nov. 1957
1073	Technological Report on samples of Digvijay cotton 1956-57	Nov. 1957
1074	Spinning Test Report (No. 4937) on samples of Vijay cotton, 1956-57	Dec. 1957
1075	Spinning Test Report (No. 4938) on samples of L.S.S. cotton 1956-57	Dec. 1957
1076	Spinning Test Report No. 4939 on samples of M. C. U. 2 (Summer) cotton, 1957	Dec. 1957
1077	Spinning Test Report (No. 4940) on samples of Cambodia Co. 2 (Avanashi) cotton 1956-57	Dec. 1957
1078	Spinning Test Report No. 4941 on samples of Cambodia Co. 2 (Dharapuram) cotton, 1956-57	Dec. 1957
1079	Spinning Test Report (No. 4942) on samples of M.C.U. 1 (Winter) cotton, 1956-57	Dec. 1957
1080	Technological Report on samples of Laxmi (9-3) cotton, 1956-57	Dec. 1957

Summaries of Technological Bulletin, Series A. No. 94 and Series B, Nos. 55 to 61 are given below :—

*Technological Bulletin Series A, No. 94*

*Effect of storage of baled Indian cottons at Bombay and at their respective growth centres on the lint quality.*

This paper describes the results obtained in an investigation carried out at the Technological Laboratory with a view to ascertain the effects produced on the lint quality when cotton is stored in a bale form in a commercial godown at Bombay and at the place of growth of a cotton. For this purpose 15 commercial bales each of Jarila, Cambodia Co. 2 and P.A. 124F were stored in a Bombay godown, 15 bales of each of Jarila and Cambodia Co. 2 were stored at the same time at Jalgaon and Coimbatore respectively. Samples from all the 15 bales of each variety at each place were initially drawn and subsequently from 3 bales every six months thus exhausting all the bales in 2½ years. These were tested at the Laboratory for (1) whiteness, (2) Pressley strength index, (3) Blow-room loss, (4) Card loss, (5) Lea strength, (6) Lea extensibility per cent and (7) Neppiness. The last 3 bales of the three varieties stored in Bombay and those of Jarila stored in Jalgaon were stored for a further period of 1½ years from January 1947 to January 1951. Samples from these three bales were drawn every 6 months and subjected to the same tests as stated above.

A similar experiment was conducted on bales of Broach Vijay cotton from June 1951 to January 1954. The following conclusions may be drawn from the results obtained :—

1. Storage for more than 1½ years, on the whole, adversely affected the colour of the cotton. Cambodia Co. 2 did not, however, show any change in colour when stored in Coimbatore while it had indicated a marked change when stored in Bombay. Thus, the same cotton stored in a comparatively drier place was affected to a lesser extent in colour.
2. Cambodia Co. 2 and Vijay stored in Bombay and in their respective places of growth maintained nearly the same fibre-strength even after 2½ years' storage. But Jarila stored in Bombay and in Jalgaon, and P. A. 124F recorded a significant decrease after storage for 2½ years.
3. It may be stated that waste losses were not affected to any extent by storing these cottons for 2½ years.
4. Storage of these cottons even for 4 years did not adversely affect the quality of the yarns spun from them. Cambodia Co. 2 did not show any difference in lea strength whether stored at Bombay or at Coimbatore. Taking yarn strength into consideration, storing Jarila at Jalgaon appeared to be more beneficial than at Bombay; the same was the case with Vijay.

5. If a cotton were to be made into a fabric which involved yarn strength and extensibility, it seemed immaterial whether fresh cotton or that stored for even 4 years was used, because storage did not affect either of the two characteristics of the yarn spun from it, though some discolouration was produced.
6. The trade practice of discounting stored cotton chiefly on the basis of discolouration could not be justified in the light of the results obtained in this investigation.
7. It seemed to be advantageous to store these varieties in their respective places of growth which, in the present case, happened to be much drier than Bombay.
8. Storage, generally, had no adverse effect on yarn extensibility. It was only Cambodia Co. 2 when stored in Bombay and in Coimbatore that showed a significant decrease in extensibility on storage.
9. It may be noted that generally the neps per yard of yarns were significantly lower when spun from a cotton stored for a period of 2½ years ; these were further reduced by storage upto a period of 4 years. Generally, the neppiness of yarns spun from the samples stored for even 4 years was independent of the place of storing the bales.

*Technological Bulletin Series B, No. 55, A Comparative Study of the Commercial and Laboratory Valuations of the Cotton Lint produced with Cleaning before and after Ginning.*

The following conclusions may be drawn from the results obtained in this investigation :—

- (1) As could be expected, cleaning the lint in a Crighton Opener before baling improved the grade of a cotton for marketing purposes and further the waste in the blow-room during the spinning was reduced.
- (2) Changes in beater and fan speeds of the Crighton did not produce any appreciable difference in the cleanliness of the lint.
- (3) According to the present valuation the premium paid for the improvement in the grade of a cotton as a result of cleaning it before baling was too small to compensate for the loss in weight and expenses incurred for cleaning the cotton and to make it profitable for sale in the open market.
- (4) It may, however, be remarked that if a mill gets its supply of cotton from its own ginning factory, it would be profitable to clean the lint before baling.



- (5) The conclusion given in (3) above holds good also for cleaning the seed-cotton before ginning. As at present, the premium obtained might not be sufficient to serve as an incentive for giving pre-cleaning treatment to seed-cotton.
- (6) It might be suggested that it would be advisable to clean the seed-cotton before ginning, especially the very trashy cottons. The grader should also give the premium commensurate with the improvement in the grade.

*Technological Bulletin Series B, No. 56. A review of the studies of the relationships between the spinning value and the chief fibre properties of a cotton.*

It is an extensive review of a number of investigations carried out both in this country and abroad to correlate the spinning value with one or more fibre-characters. As it contains nearly 100 references, it is expected to be of great value to those who are interested in the subject or want to specialise in it.

*Technological Bulletin Series B, No. 57, Relationship between the single thread strength and the chief fibre properties.*

The following chief conclusions may be drawn from the results obtained in this investigation :—

- (i) Among the fibre properties studied, mean fibre-length and the fibre-weight per unit length contribute most to the single thread strength of 20s and 30s counts.
- (ii) As regards fibre strength, it was found that Pressley strength index could with advantage replace individual fibre strength in the regression equation without loss in the precision of the estimate of yarn strength.
- (iii) The maturity coefficient and fibre-length irregularity percentage appear to contribute very little towards the single thread strength.

*Technological Bulletin Series B, No. 58, Further spinning tests on micro-samples of cotton.*

After the publication of the results of micro-spinning tests for 30s counts it was felt that this work be extended to other counts commonly spun in the Laboratory namely 14s, 20s and 40s. The results of these tests are reported in the bulletin. It is found that the correlation coefficient between the two methods of testing cotton namely by the bulk spinning method and micro-spinning method is always very high and varies between 0.83 to 0.88 for the different counts. It is also found that the 30s and 40s yarns spun by micro-method are slightly stronger than those by bulk method whereas reverse is the case for 14s and 20s yarns.

Regression equations to find the strength of yarns by bulk method from the strength obtained by micro-method have also been given.

*Technological Bulletin Series B, No. 59, Standardization of the Nep-counting Technique for cotton lint.*

As a result of the findings made in this investigation, the following standard method for the determination of the nep-count in raw cotton is recommended :—

*Preparation* : Representative pinches (about 32) should be taken at random from the sample so as to get a total weight of about 300 to 500 mgms. From this sample, small tufts should be separated out and laid on a black card board so as to form a thin web. (No hand sliver is to be prepared). The whole sample should be spread evenly on four cards as far as possible. The card should be covered with a Perspex sheet suitably sub-divided into rectangular areas.

*Examination* : The card should be placed in a spot where there is good light and examination should be made under a lens having a magnification of about four.

*Items of neps* : Neps formed of (i) fibres (F), (ii) seed-coat fragments(S), and (iii) bits of leaf (L) are to be counted and entered separately. Seed-coat fragments should normally have a tuft of fibres or fuzz attached to them. Fibre neps smaller than about  $\frac{1}{4}$  mm. are not to be counted as neps. Neps should be entangled and knotted.

*Nep Index* : The nep-index, N, is given by,  

$$N = F + S + 0.05 L$$

In order to minimize personal errors of the nep-count, it is necessary that check laboratory tests should be made with some standard cards and the results exchanged.

In order to minimize personal errors of the nep-count, it is necessary that check laboratory tests should be made with some standard cards and the results exchanged.

*Instrument for Counting Neps* : In order to count the neps following the standard procedure stated above, it is necessary to have a convenient apparatus by means of which the count could be made easily and accurately. Such a one was designed and is described elsewhere.

*Technological Bulletin Series B, No. 60, Degradation of Cotton during Mechanical Processing.*

Degradation due to mechanical processing, in four varieties of Indian cotton, viz., Laxmi, Suyog, Cambodia Co. 4 and Gaorani, has been investigated and com-

pared with the degradation caused by mild alkali boil. Samples tested at different stages of ginning and spinning processes show a measurable amount of degradation which does not appear to be significant compared to the degradation brought about by subsequent wet-finishing processes.

*Technological Bulletin Series B, No. 61, The relationship between the Micronaire reading and the fibre-weight obtained by weighing whole fibres.*

The correlation coefficient  $r_{xy}$  is found to have a value of 0.931 which is highly significant (.01 level); this shows that these two measures of fineness are correlated with each other to a very high degree.

From the data, the following regression equation has been calculated :—

$$Y = .030588 X + .01916, \text{ where}$$

X = Micronaire reading  $\left(\frac{\mu\text{g}}{\text{in}}\right)$

Y = Fibre-weight per unit length  $\left(10^{-6} \frac{\text{oz.}}{\text{in.}}\right)$

This equation will enable one to estimate the value of fibre weight per unit length from the micronaire readings whenever necessary.

## APPENDIX III

*Scientific and Technological staff of the Technological Laboratory as on the 31st May, 1958.*

<i>Designation</i>	<i>Name</i>
1. Director	Dr. R. L. N. Iyengar, D.Sc. (Madras)
2. Senior Research Officer	Shri Harirao Navkal, M.Sc. (Cal.).
3. —do—	Shri K. S. Bhujang, M.Sc. (Tech.) (Bom.).
4. —do—	Dr. V. Sundaram, M.Sc., Ph.D., A.R.I.C.
5. Spinning Master	Shri V. V. Gupte, B.Sc., Tech. (Manch.), B.Sc. (Bom.).
6. Junior Research Officer	Shri V. Venkataraman, M.A., (Madras).
7. —do—	Shri Jai Prakash, M.Sc.
8. —do—	Dr. S. M. Betrabet, M.Sc., Ph.D.
9. —do—	Shri N. Balasubramanian, B.Sc., B.Sc., (Tech.) (Madras).
10. Research Scholar	Shri T. V. Krishnan, M.Sc.
11. —do—	„ V. G. Munshi, M.Sc.
12. Supdt., Testing House	„ K. G. Deo
13. Head Assistant (Testing)	„ V. N. Modak, B.Sc.
14. —do—	„ K. V. N. Nayar
15. Senior Assistant, (Testing)	„ R. G. Panvalkar, B.Sc.
16. —do—	Shri P. V. Nachane, B.Sc.
17. —do—	„ B. G. Mehta
18. —do—	„ S. Samson, B.Sc., LL.B.
19. —do—	„ S. B. Mogre, B.Sc.
20. —do—	„ P. D. Vakil
21. —do—	„ C. A. S. Iyer, B.Sc.
22. —do—	„ S. Ramanathan
23. —do—	„ J. M. Shah, B.Sc.
24. Junior Assistant (Testing)	„ K. P. Ramakrishna Pillai, B.Sc., A.T.I.
25. —do—	„ R. Narayana Rao, B.Sc.
26. —do—	„ H. M. Almeida, B.Sc.
27. —do—	„ R. Braganza, B.Sc.

<i>Designation</i>	<i>Name</i>
28. Junior Assistant (Testing)	Shri K. N. Seshan, B.Sc.
29. —do—	„ P. G. Oka, B.Sc.
30. —do—	Smt. S. B. Pai, B.Sc. (Hons.)
31. —do—	Shri G. G. Phadnis, B.Sc.
32. —do—	„ M. N. Upponi, B.Sc.
33. —do—	„ M. S. Sawant, B.Sc.
34. —do—	„ M. G. Rege, B.Sc.
35. —do—	„ R. Dharakanath, B.Sc.
36. —do—	„ S. Srinivasan, B.Sc.
37. —do—	*Kumari Indira G. Bhatt, M.Sc.
38. —do—	Shri K. S. Subbanarasimha, B.Sc.
39. —do—	Smt. K. L. Datar, B.Sc.
40. —do—	Shri M. G. Nambiar, B.Sc.
41. —do—	„ A. N. Balasubramanian, B.Sc.
42. —do—	„ S. R. Ganatra, B.Sc.
43. —do—	„ A. W. Shringarpure, B.Sc.
44. —do—	„ C. K. Ramachandran, B.Sc.
45. —do—	„ V. M. Kamath, B.Sc.
46. —do—	„ B. N. Lalwani, B.Sc.
47. —do—	„ P. N. Elayathu, B.Sc.
48. Senior Asstt. (Stat.)	Shri K. Venkateswaran, B.A.
49. —do—	„ P. D. Ghangurde, M.Sc. (Stat.)
50. Junior Asstt. (Stat.)	Kumari S. P. Gupte, B.A.
51. —do—	Shri S. G. Nayar, B.Sc.
52. Engineering Asstt. (Ginning).	„ D. G. Shete, L.M.E.
53. Engineering Asstt. (Electrical).	„ H. V. Tamhankar, L.M.E., L.E.E.
54. 1st Spg. Asstt.	„ A. G. N. Iyengar
55. 2nd Spg. Asstt.	„ M. S. Bhawsar, B.Sc. (Text)
56. —do—	„ S. A. Shankarnarayan, B.Sc. (Text.)
57. Draughtsman	„ Y. N. Tendulkar
58. Mechanic	„ Mohamed Masthan Shaikh

\*Appointed as Temporary Chemical Assistant.

