

STUDIES IN MOISTURE REGAIN OF SOME PAK COTTONS AND YARNS

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(Received June 5, 1967)

Studies in moisture regain of raw cotton and yarn in some Pak cottons were conducted at Lyallpur during the years 1965-66. The varietal differences were found to be highly significant with actual range of 7.43 in L11 to 11.05% in 231R. Desi cottons recorded higher values than Pak varieties. The actual values for 231R and S.N.R. were 10.33 and 11.05 as compared to the highest value of 8.31% for L.S.S. in the Pak varieties followed by AC321, M100 and 362F. The differences in moisture regain of yarn due to varieties were highly significant, the actual range being 6.01 in 124F to 9.05% for 231R. The highest value of 7.03% in Pak cottons was recorded in case of L.S.S. followed by AC 321, M100 and 362F. Desi varieties recorded higher values as compared to Pak varieties and higher values of moisture regain of raw cotton and yarn were found to be associated with coarser and more mature fibres.

Introduction

The successful and economical processing of the raw material in the textile mills entirely depends on the available information about the specific quality characters of the various lots, such as non-lint contents of raw cotton and moisture regain of raw cotton and yarn. The moisture regain percentage is the weight of moisture present in the material expressed as a percentage of the weight of moisture-free material, whereas the moisture content percentage is the weight of moisture in a material expressed as a percentage of the total weight. The standard moisture regain for raw cotton is 8.5% and for yarn it is 7.0 to 7.5%. Higher values of moisture regain result in increased strength of yarn, more pliability which renders easy working of the material, reduces amount of dust and fly, and permits greater bodily comfort for personnel in cool weather. The knowledge of these characters is helpful in purchasing the cotton for processing. Any wrong or insufficient information of cotton varieties being purchased can lead to unnecessary high losses in processing, i.e., blowing and spinning and uneven yarn and uneconomic production, and mill failures. Artificial humidity is required to be given in case of low moisture regain at different stages. Textile industry is therefore, required to be in constant touch with the latest information about fibre quality characters.

Studies in moisture regain of raw cotton and yarn were undertaken at Lyallpur during the years 1965-66 under different sowing dates and manurial treatments. The results obtained from these studies are presented in this paper. No work has been done and reported earlier on moisture regain of raw cotton and yarn in the present-day commercial varieties and most promising new strains of Pak cottons.

Material and Methods

The present studies were undertaken with samples from 12 varieties at the West Pakistan Agricultural University, Lyallpur, during the year 1965-66. The design of the experiment was split plot. The samples of varieties under study were 4F, LSS, 362F, M4, 124F, AC134, M100, L11, AC307 AC321, 231R and SNR. There were 4 sowing dates, i.e. 15th May, 25th May, 5th June and 15th June and four manurial doses i.e. control, 0,50, 100 and 150 lb of nitrogen per acre. All the agricultural operations were normal for this zone within the natural limitations, and the sample obtained were, therefore, fully representative of the varieties and treatments.

Moisture regain of raw cotton and yarn was determined with the help of Shirley moisture meter at $70^{\circ}\text{F} \pm 2.0$ and $65\% \pm 2.0$ relative humidity during prior conditioning for 4 hr and testing. Ten readings were taken from different places of each sample $\frac{1}{2}$ in thick for raw cotton and bobbin was placed at a uniform place to get a representative regain value. For each reading, the sample was put on a firm non-absorbent base (varnished wood). The electrode was pressed on it with the handle perpendicular to the base. The pressure on the electrode was increased steadily until the needle stopped moving and the value of regain corresponding to the stationary position of the needle was recorded. Seven varieties, i.e., AC307, M4, 124F, M100, L11, AC134, AC321 were spun to 40's, 3 varieties i.e. L.S.S. 362F and 4F were spun to 20's and 2 varieties 231R and S.N.R. were spun to 10's. The range of twists per in in 40's was 23.40 to 28.61; for 20's it was 18.63 to 20.59 and for 10's it was 16.01 to 17.42. Shirley miniature spinning plant was used for spinning of different counts of yarn and twists per in were determined by untwist-twist method according to A.S.T.M. standards 1963.

Results

The results pertaining to moisture regain of raw cotton and yarn are presented in Tables I and 2 and the original data are given in Appendices I and II.

Discussion

Moisture Regain of Raw Cotton.—The data regarding the moisture regain of raw cotton of various varieties given in Table I show that the differences in mean values due to various varieties

were highly significant, whereas those for manures and sowing dates were significant during the year 1965-66. Both the short and coarse staple desi varieties (data given in Table 3) recorded comparatively much higher moisture regain values than that of the Pak varieties as a group, the actual values being 11.05 and 10.33 for 231R and SNR respectively, and the differences were significant. In the case of Pak varieties, LSS gave the highest value of 8.31 followed by AC 321, M100 and 362F with actual values of 8.27, 8.18 and 7.99 which showed non-significant differences within themselves. LII gave the lowest value of moisture regain.

TABLE I.—ANALYSIS OF VARIANCE OF MOISTURE REGAIN OF RAW COTTON 1965-66.

Due to	D.F.	S.S.	M.S.	F. Ratio	FO.05	FO.01	Remarks
S	3	0.660	0.220	1.11	3.86	6.99	N.S.
M	3	0.947	0.315	1.59	3.86	6.99	N.S.
E I	9	1.782	0.198				
V	11	245.090	22.280	89.47	1.86	2.39	**
V x M	33	1.735	0.052	0.208			
E II	132	32.9150	0.249				
Total	191	283.129					

Varieties:

S.E.	=	0.12
S.E.D.M.	=	0.18
Cd ₁	=	0.36
Cd ₂	=	0.47

Mean for Varieties:

231R	S.N.R.	L.S.S.	AC321	M100	362F	M4	4F	AC134	AC307	124F	LII
11.05	10.33	8.31	8.27	8.18	7.99	7.79	7.75	7.71	7.41	7.36	7.34

TABLE 2.—ANALYSIS OF VARIANCE OF MOISTURE REGAIN OF YARN 1965-66.

Due to	D.F.	S.S.	M.S.	F. Ratio	Fo.05	Fo.01	Remarks
S	3	0.366	0.122	1.09	3.86	6.99	N.S.
M	3	0.687	0.229	2.06	3.86	6.99	N.S.
EI	9	1.003	0.111				
V	11	140.821	12.801	301.2	1.86	2.39	**
VxM	33	4.904	0.148	3.48			
EII	132	5.622	0.042				
Total	191	153.403					

Varieties:

S.E.	=	0.05
S.E.D.M.	=	0.07
Cd ₁	=	0.14
Cd ₂	=	0.19

Mean for Varieties:

231R	SNR	LSS	AC321	M100	362F	4F	M4	LII	AC134	AC307	124F
9.05	8.54	7.03	6.86	6.69	6.69	6.52	6.48	6.48	6.42	6.38	6.01

N.S., not significant.

**, Lightly significant.

TABLE 3.—MOISTURE REGAIN AND OTHER CHARACTERISTICS OF VARIOUS VARIETIES (1965-1966).

Varieties	Moisture regain %		Staple length mm	Fineness micro- naire value	Maturity %
	Raw	cotton Yarn			
231R	11.05	9.05	15.77	7.09	83.83
S.N.R.	10.33	8.54	16.33	7.21	81.94
LSS	8.31	7.03	24.33	4.41	79.85
AC321	8.27	6.86	24.49	4.15	78.93
M100	8.18	6.69	24.37	3.82	77.56
362F	7.99	6.69	24.10	3.90	77.59
M4	7.79	6.48	24.60	3.83	76.00
4F	7.75	6.52	22.74	4.57	79.02
AC134	7.71	6.42	24.58	3.76	77.12
AC307	7.41	6.38	23.89	4.48	79.87
14F	7.36	6.01	23.62	4.12	79.38
LII	7.34	6.48	24.93	3.97	78.28

The very high moisture regain values of raw cotton of 231R and SNR i.e. 10.33 to 11.05 are closely linked with very short staple 15.77 and 16.33 mm, very coarse fibres i.e. higher micronaire values of 7.09 and 7.21 $\mu\text{g/in}$, and higher values of fibre maturity i.e. 81.94 to 83.83%; whereas the moisture regain range of 7.34 to 8.31% in Pak varieties has been found to be associated with comparatively higher staple length i.e. 22.74 to 24.93 mm; greater fineness or lower values of micronaire i.e. 3.76 to 4.57 $\mu\text{g/in}$, and lower range of fibre maturity i.e. 76.00 to 79.87%. The differences of moisture regain in raw cotton in Pak varieties, though significant, are limited as is the case with other similar cottons of *G. hirsutum* L group, which are grown and processed in most of the foreign countries, whereas the short and coarse staple of more mature cottons like 231R, and SNR, which belong to *G. arboreum* L group, are neither grown nor processed in U.S.A. and other countries and therefore the present findings are rather outstanding in view of varietal and other variations in fibre length, fineness and maturity as reported by Milne (1922, 1924), Afzal (1930, 1936) and Trought (1930, 1931).

Moisture Regain of Yarn.—The results regarding the moisture regain of yarn of various varieties given in Table 2 show that the differences in mean

values due to various varieties were highly significant, while sowing dates and manurial effects were non-significant. Both the short and coarse and more mature desi varieties 231R and SNR gave comparatively higher values of moisture regain than those of the Pak varieties. The highest moisture regain was observed in 231R followed by SNR. In the case of Pak varieties LSS, the commercial variety of Lyallpur zone gave the highest value followed by AC321 and M100 and the differences between these types were significant. Varieties 4F, M4, LII, AC134 and AC307 gave non-significant differences among themselves. 124F recorded the lowest value of moisture regain.

LSS seems to be outstanding out of Pak varieties in having highest value of 7.03% as compared to the least value of 6.01% for 124F as given in Table 2.

Table 3 shows that the higher value of moisture regain of yarn in the case of 231R and SNR i.e. 9.05 and 8.54% is closely associated with shorter staple (15.77 and 16.33 mm), coarse (7.09 and 7.21 $\mu\text{g/in}$) and more mature fibres (83.83 to 81.94%) as compared to the lower range of values i.e. 6.01 to 7.03% in the case of Pak group of varieties with longer, finer and comparatively less mature fibres.

Moisture regain in both raw cotton and yarn, therefore, seems to be closely related to varying levels of fibre fineness and maturity, which are definitely varietal characters.

References

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4. T. Trought, Agri. J. Ind., 35-IV (1930).
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Appendix I

Original Data of Moisture Regain of Raw Cotton 1965-66.

Variety	S1				S2				S3				S4			
	M0	M1	M2	M3	M0	M1	M2	M3	M0	M1	M2	M3	M0	M1	M2	M3
AC307	7.02	7.60	7.20	7.27	7.50	7.15	7.27	7.45	7.45	7.25	7.30	7.55	7.42	8.00	7.45	7.80
362F	7.65	7.50	7.65	7.85	7.80	7.68	8.40	8.20	8.80	8.76	8.60	8.50	7.70	7.85	7.60	7.40
AC134	8.96	9.04	7.66	7.58	8.66	7.56	7.18	8.44	7.30	7.70	7.16	6.95	7.14	7.40	7.38	7.40
M100	8.70	8.90	8.80	8.60	8.60	8.90	9.30	8.75	7.50	7.80	7.60	7.50	7.40	7.60	7.50	7.50
4F	7.37	7.60	7.80	7.62	7.90	8.10	8.20	7.86	7.80	8.00	7.60	7.50	7.60	7.80	7.70	7.70
AC321	8.02	7.77	8.20	7.50	7.89	7.80	8.62	8.67	8.46	8.25	7.95	8.87	8.60	8.48	8.35	8.95
L11	7.50	7.00	7.64	7.58	7.20	7.30	7.30	7.30	7.15	7.10	8.00	8.25	7.35	7.30	7.40	7.20
LSS.	7.80	8.10	7.90	7.75	8.20	8.42	8.50	8.40	8.60	8.84	8.08	8.00	8.50	8.70	8.60	8.60
231R	11.26	10.86	11.55	11.10	11.24	10.68	11.43	11.00	10.71	11.26	11.10	10.83	10.90	11.20	11.00	10.80
SNR.	9.76	11.74	11.02	10.76	9.50	9.38	10.58	9.90	9.78	11.26	9.60	9.68	9.70	10.90	11.00	10.80
124F	6.78	7.90	8.06	8.14	7.40	7.76	7.08	6.65	7.25	7.40	6.75	6.65	7.46	7.60	7.50	7.40
M4	7.15	7.80	8.20	7.90	7.65	6.62	7.90	8.50	7.50	7.65	7.90	8.00	7.60	7.80	7.90	7.70

Manures

M0 = Control
M1 = 50 lbs nitrogen per acre
M2 = 100 lbs " " "
M3 = 150 lbs " " "

Sowing dates

S1 = 15th May
S2 = 25th May
S3 = 5th June
S4 = 15th June

Appendix II

Original Data of Moisture Regain of Yarn 1965-66.

Variety	S1				S2				S3				S4			
	M0	M1	M2	M3	M0	M1	M2	M3	M0	M1	M2	M3	M0	M1	M2	M3
AC307	6.40	6.10	6.50	6.40	6.65	6.28	6.20	6.20	6.58	6.20	6.25	6.30	6.72	6.88	6.24	6.30
362F	6.45	6.70	6.68	6.50	6.40	6.65	6.84	7.40	7.54	6.92	7.35	7.25	5.92	6.22	6.40	5.85
AC134	6.63	6.65	6.24	6.70	6.50	6.63	5.78	6.56	6.42	6.55	6.25	5.88	6.24	6.48	6.65	6.72
M100	6.84	6.90	7.00	6.92	6.66	7.25	6.60	6.50	6.43	6.80	6.78	6.28	6.42	6.58	6.80	6.25
4F	6.05	6.20	6.95	6.15	6.24	6.88	6.97	6.55	6.22	7.24	7.24	6.42	6.26	6.44	6.60	6.52
AC321	6.12	6.52	6.07	6.65	6.25	6.50	6.50	6.80	7.52	7.48	6.99	7.30	7.58	7.54	6.75	7.22
L11	6.75	6.80	6.78	6.68	6.42	6.40	5.95	6.01	6.45	6.00	7.42	6.60	6.50	6.35	6.40	6.22
LSS	6.60	6.60	6.85	6.20	7.15	6.90	6.77	7.24	7.42	7.15	7.02	7.00	6.86	7.68	7.62	7.56
231R	9.05	8.97	9.35	9.20	9.16	8.92	9.10	9.00	8.78	9.18	9.20	8.88	8.82	9.20	9.25	8.77
SNR	7.99	9.26	9.20	8.80	7.98	7.66	8.65	8.92	8.04	8.08	7.84	8.00	8.02	9.15	9.55	8.64
124F	6.10	5.87	6.25	6.70	6.40	6.62	6.22	5.15	6.46	6.40	5.05	5.18	6.00	6.10	5.95	5.80
M4	6.70	5.87	6.35	6.62	6.60	6.32	6.75	5.95	6.66	6.62	6.80	6.77	6.42	6.60	6.72	6.22

Manures

M0 = Control
M1 = 50 lb nitrogen per acre
M2 = 100 lb nitrogen per acre
M3 = 150 lb nitrogen per acre

Sowing dates

S1 = 15th May
S2 = 25th May
S3 = 5th June
S4 = 15th June