

EVALUATION OF TWIST MEASUREMENTS BY TWO METHODS IN SOME COUNTS FOR TWO EGYPTIAN COTTON VARIETIES

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ABSTRACT

There are two main methods for twist examination ,the first one is untwist method and the second is untwist-twist method . Giza 85 long staple (LS) and Giza 70 extra long staple (ELS) cotton varieties were spun to yarns of 30s,40s,50s and 60s counts and tested by the two methods based on recommended of (ASTM D 1422-85).One inch Distance between clamps and slight pretension were used in untwist method . In untwist -twist method distance between clamps of 3. 5. 10 and 15 inches were used . Pretensions of 2,3,4,5,6,7 and 8 grams were applied for each distance between clamps to select the appropriate distance and pretension. The results indicated that no significant differences between nominal twist and evaluated twist by the two methods . CV% within test specimens in untwist-twist method were more regular than that of untwist method. G70 was accomplished even yarns than G85 in the studied counts.. The appropriate distance between clamps in untwist-twist method was 15 inches for all tested counts. The appropriate pretensions were 8,5,4 and 4 grams for the counts 30s,40s,50s and 60s ,respectively.

INTRODUCTION

It was reported that twist is produced by the rotation of traveler about the spindle axis. It would be seen to follow from this that the amount of twist inserted into the yarn must be determined by the number of revolutions made by the traveler while a unit length of yarn is delivered by the drafting system.

From the engineering standpoint , the interesting thing about the twist is that the spinning machine inserts fixed turns per unit length for each twist factor.The yarn is assumed to be regular and circular in cross section, also each fiber follows helical path around yarn cylinder.

On the contrary the variation in the strand count , the existence of fiber migration , the different fiber lengths and the variation in other fiber properties were falsified the inserted twist.

Cotton yarns were spun to different counts with designated twist factor to withstand the stresses of arrangement and fabric manufacture. The choice of twist factor is connected to the use of yarn, for example weft needs lower twist than warp, fine yarns necessity twist increased than coarse.

Then the problem is how to measure the idealized twist which inserted to spun yarns .Consequently the assessment of twist of considerable accuracy in applied specimen is seriously significant to know how much twist inserted as check of machine set up.

There are two main methods for twist examination ,the first one is untwist method and the second is Untwist-twist method. Errors can arise in determining twist by both untwist method or untwist-twist procedure, for

example, pretension is excessive or too slight, or the tension is not removed at the zero length, also the appropriate specimen length.

Grover and Hamby(1966) reported that untwist-twist method is based on the assumption that the contraction of a given length of single yarn is the same for any given amount of twist per inch no matter whether Z or S twist is used. The untwisting of this yarn under a very slight tension and retwisting the sample in the opposite twist direction until the contract length matches exactly the original length. The total twist in the original sample is equal to the twist removed plus the twist added, which in turn is equal to the total revolution of the twist head divided by 2. Yarn that has been slashed or treated in any way with gums, starches, resin, or other chemicals fails to exhibit normal results, and the untwist-twist method is not used for yarns of this nature.

Booth (1968) reported that turns required to cause the untwist yarn to contract to its original length equal to the number of turns originally in the yarn. He added that unfortunately, this is not always true. It has been found that for some yarns the turns per inch determined by the twist contraction method are under estimated, while for other yarns are overestimated when the values are compared with those obtained by the standard straightened fiber method.

As far as count is concerned Nanjundayayya(1966) postulated that the yarn evenness has considerable effect on twist regularity. Foster (1958) indicated that at the same count, the finer cottons produced even yarns than the coarse cottons, Zaher et al (1975) found that as the count of the yarn increased the evenness decreased, El-Hariry et al. (1990) reported that the fiber length was an important contributor to yarn evenness, Abd-EL-Aliem (1995) concluded that both fiber length and fineness correlated reversely with yarn evenness.

MATERIALS AND METHODS

Materials:

Each of Giza 85 long staple (LS) and Giza 70 extra long staple (ELS) cotton varieties were provided by the Cotton Research Institute A.R.C.

Methods:

The standard 60 grams microspinning technique was followed under controlled atmospheric conditions of $20\text{c} \pm 2\text{c}$ temperature and relative humidity $65\% \pm 2\%$

Production of carded yarns

- 1- Both G85 and G70 carded yarns were spun to 30s, 40s, 50s and 60s counts.
- 2- Twist factor 3.6 was chosen because it is routinely used in Spinning Research Department for LS and ELS spun yarns.

The inserted twist was tested by the following two methods based on recommended of (ASTM D 1422-85, 1985):

Untwist-method:

Good Brand twist tester is used in this method. The specimen was under slight tension. 50 specimen were tested for each treatment of one inch

length manually. Number of turns per inch and(CV%)of the differences between test samples were abbreviated to M.T.P.I and M.CV% respectively.

Nominal number of turns per inch was calculated from the formula
(Number of turns per inch = twist factor $\times \sqrt{\text{count}}$ and was abbreviated to N.T.P.I

Untwist-twist method :

S.D.L (Y220B.s) twist tester was used for this method , which produced by Shirley Developments LTD , and put to use recently in the routine work of Spinning Research Department to measuring twist for LS and ELS varieties spun yarns .

The treatments of SDL twist tester were as follow:

- 1- Pretension (weight in grams) 2,3, 4, 5, 6, 7 and 8 grams
- 2- Distance between the clamps (specimen length) 3, 5, 10 and 15 inches.
- 3- Medium speed
- 4- 20 specimens were tested for each treatment.
- 5- Number of turns per inch and(CV%)of the differences between test samples were abbreviated to A.T.P.I and ACV% respectively
- 6- Number of turns per inch attained at appropriate pretension and appropriate distance between clamps with lowest cv% between specimens values is called common A.T.P.I or common (S.D.L) A.T.P.I

The yarn evenness:

Yarn evenness expressed in terms of CV% was assessed by the Uster Evenness Tester 3 .

Statistical analysis

The estimation of statistical parameter coefficient of variation (CV%) and the comparison between means according to T test procedure (at 5% level of significant) were subjected following SAS statistical techniques (1985) on computer .

Data presentation

Every count of studied varieties was represented graphically. Horizontal axis represents each of turns per inch(T.P.I) and coefficient of variation(cv%). Vertical axis divided to four parts each part represent a distance between clamps .A.T.P.I and its A.CV% of each pretension were represented by two columns beside each other. legend abbreviations for A.T.P.I and A.CV% were (pretntion in gram (g) - A.T.P.I) , for example 2g - A.T.P.I means (actual twist per inch of 2 grams pretention) , and 2g - CV% means (actual twist per inch of 2 grams pretention) , and 2g - CV%

RESULTS AND DISCUSSION

Usually twist is not distributed regularly along the yarn by reason of it's connective to count. Number of researchers (Foster 1958 and Nanjundayayya 1966) investigated this correlation and concluded that a relation exists between the twist and the density of the yarn at which place the turns per unit length are measured, and added that twist runs to thin places more than thick places .

Tables (1) and (2) show the values of the untwist method of twist measuring in the spun yarns of each of Egyptian cotton varieties Giza 85(LS) and Giza 70 (ELS) ,respectively. The values of Giza 85 counts (M.T.P.I) were 20.1,23.2,25.7,and 28.3 for the respective counts 30s,40s,50s and 60s .The difference between M.T.P.I and N.T.P.I of each value was so small and acceptable as a random error and insignificant according to T test

The respective M.CV% values for the previous counts were 13.4, 14.1, 14.8 and 15.2 .

The M.T.P.I values of G70 spun yarns were 20.4,23.2,25.9 and 28.1 for the counts 30s,40s,50s and 60s,receptively, and they deviated about theirs N.T,P.I with acceptable differences according to statistical T test.. The respective values of M.CV% for previous G70 spun yarns were 12.1,12.6, 12.8 and 13.4.The preceding results presented two trends, the first was the low values of M.CV% of G 70 spun yarns at the same count than those of Giza 80 spun yarns ,the second was the increased of M.CV% values as the count increased in the spun yarns of the two varieties. It could be explained on the bases that the ELS cotton varieties achieved high regularity in the spun yarns at the same count than that yarns of LS varieties and the regularity of twist distribution along yarn length was associated positively to yarn regularity table (3) shows the evenness of G85 and G70 tested yarns . Foster 1958; Zaher et al 1975 and Abd-El-Alim 1995 concluded that at the same count ,the finer cotton produced even yarns than coarse cotton. Concerning untwist - twist method for measuring twist by S.D.L twist tester, Table (1) and Table (2) include the twist values of spun yarns of G85 and G70 varieties ,respectively.

As show in Table (1) and Figure (1) of G83 A.T.P.I for 30s count spun yarns under the same D.B.C were generally increased in the direction of increasing the pretension from 2 to 8 grams. On the contrary the A.CV% values were reduced at the same direction. That preceding trends were given under each D.B.C of 3, 5 ,10 and 15 inches.

As well as in table (2)and figure (2) of G 70 spun yarns, the same trends of A.T.P.I and A.CV% of G85 spun yarns were observed they only differ in its values.

It is clear that the common A.T.P.I achieved under 8 grams pretension at D.B.C of 15 inches, the other pretensions got lower A.T.P.I, that by reason of the lower pretensions which didn't completely remove the tension inside the fiber strand to get zero length ,accordingly the number of turns in both untwist and retwist directions were lowly than the actual number of turns along the fiber strand. This result resumed the effect of twist tension inside the yarn and the number of fibers in the cross section which need more weights to be parallel, furthermore, that of direct observation of the higher A.CV% at lower pretensions . The decreasing of A.CV% by increasing the specimen length (D.B.C) at the same pretension due to the incontestable relation between yarn regularity and each of count and twist.Grover and Hamby (1966) and Booth (1968) found the same results in their researches .

Table (3): Comparison between N.T.P.I, M.T.P.I And Common (S.D.L) A.T.P.I Also, M.CV% , S.D.L A.CV% and The Regularity Of Yarns In The Different Counts of Giza 85 And Giza 70

Variety	Count	N.T.P.I	M.T.P.I	M.CV%	(S.D.L) A.T.P.I	(S.D.L) A.CV%	Yarn CV%
G 85	30s	19.7	20.1	13.4	20.2	5.0	13.2
G 70	30s	19.7	20.4	12.1	20.3	4.1	12.7
G 85	40s	22.8	23.0	14.1	23.1	5.3	14.4
G 70	40s	22.8	23.2	12.6	23.0	4.8	13.6
G 85	50s	24.5	25.7	14.8	25.8	6.4	15.4
G 70	50s	24.5	25.9	12.8	26.0	5.3	14.5
G.85	60s	27.9	28.3	15.2	28.5	7.0	18.4
G 70	60s	27.9	28.1	13.4	28.7	5.7	16.3

The differences between each of N.T.P.I and M.T.P.I and(S.D.L) A.T.P.I were tested statistically according to T test .All the differences were insignificant at the same count

Table (1) and figure (3) illustrate the 40s count twist values of G85. A.T.P.I was at the same trend of the previous count (30s) . The common value of A.T.P.I established at pretensions of 5 grams . A.CV% for studied pretensions reduced in the direction of increasing pretension from 2 to 6 grams within each D.B.C , in back of that at pretensions 7 and 8 grams it reversed its direction and increased as the pretension increased. This outcome indicated that the required pretension to the degree that the zero length of the fiber strand correctly determined for 40s count were under pretensions of 5 and 6 grams , also A.CV% values indicated that increasing D.B.C decreased the differences between the specimen values within each test .the common value of A.T.P.I was attained under 5 grams pretension and 15 inches D.B.C .

Table (2) and figure (4) illustrate the results of 40s count of G 70 spun yarns .It was noticed that an identical trends of G85 spun yarns were attained with slide differences in twist values due to the nature of each variety on the point explained previously .The reasons which decreased the values of A.T.P.I than the common values under lightsome pretension was explained in the previous count . Within 40s count the heavily pretension than 5 or 6 grams increased A.T.P.I than common, that due to inappropriate tension which originate slippage in the parallel fiber in the strand when getting its zero length and that rise the specimen length ,consequently, it get more twist when retwisting .Under incorrect heavy tension, the retwisting of the expanded fiber strand added more twist than the actual at retwist direction .It was mentioned previously that the A.T.P.I referred to the mean value of removing twist and retwisting of the same specimen , that result confirmed by Booth (1968)

Regarding 50s count table (1) and figure (5) of G85 and table (2) and figure (6) of G70 , the above relation between A.T.P.I and pretension at all D.B.C was utilized ,and also the relation between A.CV% and D.B.C .The difference only in the pretension and D.B.C of the common twist which were 4 grams and 15 inches for G85 and G70 .

Considering 60s count table (1) and figure (7) of G85 the pretension and D.B.C of the common twist A.T.P.I were 4 grams and 15 inches .

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1,2

3,4

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5,6

7,8

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Table(2) figure (8) of G70 show that the pretension and D.B.C of the common twist A.T.P.I were 3 grams and 15 inches.

The above table reveals the following directions:

- 1- A.CV% were more regular than M.CV% ,owing to the counterclockwise relation between specimen length and twist regularity.The same result was reported by Grover and Hamby (1966).
- 2- G70 was accomplished even yarns than G83 in the studied counts.
- 3- G70 A.T.P.I were uniform on what occasion compared with those of G 85.The last two results(2,3) were in agreement with results Foster (1958), Zaher et al. (1975) and Abd-El-Aliem (1995).
- 4- The common(S.D.L) A.T.P.I was considered the up front value to express N.T.P.I, by reason of the cv% within test specimens was the lowest one, that announced the balance of the pretension, as well as the tested length included all the short variations which stated errors in assessing approximately twist , this result could be convinced beside the thoughts of Grover and Hamby (1966) and Booth (1968).

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تقدير البرم بطريقتين على عدود مختلفه فى صنفين من القطن المصري

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اجريت هذه الدراسه لتقييم جهاز تقدير البرم S.D.L المستخدم حديثا لقياس البرم فى الاختبارات الروتينييه بقسم بحوث الغزل ويعمل هذا الجهاز بطريقه ميكانيكيه اليكترونيه على الاسس النظرية لطريقه فك و اعاده البرم (Untwist - twist method) وذلك على مسافات (3 و5 و10 و15) بوصه بين الفكوك وشد ابتدائى 2 و3 و4 و5 و6 و7 و8 جرام وقورنت النتائج بالبرم الاسمى المقدر بالمعادلات الرياضيه وكذلك بالبرم المقدر باستخدام طريقه فك البرم (Untwist method) يدويا باستخدام جهاز جود براند وذلك فنمر الغزل الانجليزيه 30 و40 و50 و60 على معامل البرم المستخدم فى الاختبارات الروتينييه لقسم بحوث الغزل (3.6).

اختبرت المعاملات السابقه فى صنفان من الاقطان التجاريه المصريه جيزه 85 (طويل) وجيزه

70 (فائق الطول) ويمكن تلخيص النتائج فيما يلى:

- البرم عمليه ميكانيكيه بالدرجه الاولى ولكنها تتاثر بدقه اعداد ماده الخام وخواصها
- لم يلاحظ تاثير للسنف على الاتجاه العام للنتائج وان كان البرم المقدر فى اختبارات الصنف جيزه 70 اكثر انتظاما من البرم المقدر فى اختبارات الصنف جيزه 85 على ذات النمره ويرجع ذلك لزياده انتظام خيوط جيزه 70
- يتاثر البرم بخواص الانتظام لخيوط الغزل على النمر المختلفه
- انتظام البرم يزداد بزياده طول عينه الاختبار
- الاختلافات بين البرم المقدر حسابيا والمقدر بطرق تقدير البرم طفيفه وترجع لطبيعه الاختبار وكان اختبار الفرق باستخدام اختبار احصائيا غير معنوى بين المتوسطات
- انتظام البرم داخل عينات الاختبار المقدر يدويا كان قليلا لقصر طول العينه المختبره
- يحتاج جهاز S.D.L للوصول الى تقدير دقيق للبرم لمباتى:
- اختيار الشد الاولى المناسب لكل نمره غزل و تنحرف النتائج بزياده او نقص الشد
- بزياده طول العينه المختبره ينتظم تقدير البرم داخل عينات الاختبار باستخدام الشد الاولى المناسب
- يتاثر انتظام البرم المقدر داخل عينات الاختبار بانتظام خيوط الغزل بعلاقه طرديه
- اظهرت النتائج ان المسافه 15 بوصه بين الفكوك كانت الافضل فى جميع الاختبارات
- الشد الاولى المناسب لنمره 30 ت 8 جرام ولنمره 40 ت 5 جرام ولنمره 50 ت 4 جرام لكلا الصنفان ولنمره 60 ت 4 جرام للسنف جيزه 85 و3 جرام للسنف جيزه 70

