Determination of technological value for Giza 88 and Giza 92 of cotton cultivars with using two models of mathematical analysis

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ABSTRACT:

The investigation was conducted in Cotton Grade Section laboratories, Cotton Research Institute, Agricultural Research Center. Giza, Egypt and Menia El-Kameh Industrial Spinning Unit of El-Sharkia Governorate, Egypt during the 2016 and 2017 seasons. The aim of the study was to scout the relationships between fiber properties and yarn qualities. (Lea product and Single yarn strength) at 60's and 80's yarn count of Giza 92 and Giza 88 cultivars at good grade, using two analytical models, Fiber Quality Index (FQI) and the Multiplicative Analytic Hierarchy process (MI_{AHP}) with a convolution factor of 3.6. Results revealed highly positive significant correlation between MIAHP as mathematical model and both of single yarn strength and lea product for both varieties across the two seasons. Additionally, the findings, highlighted that certain fiber traits, namely Upper Half Mean Length (X_1), Short fiber content (X_3), Fiber Strength (X_6), Micronaire value (X_4), made the highest contribution and had the most significant impact on yarn quality traits at 60's and 80's yarn count for Giza 88 &Giza 92 cultivars. Furthermore, all regression models examined were found to be significant in explaining the variability of the two yarn properties. This was confirmed by the high values of R^2 and near values of the adjusted corresponding $R^{2,}$ indicating validity and good fit of the two models.

Keywords: Cotton; Technological value; Extra-long staple Egyptian models analysis. R^2; yarn.

INTRODUCTION

Cotton has a wide range of variations in terms of fiber and yarn properties. Many of these properties play a stringent role in predicting and determining yarn properties. The process of spinning cotton fiber is of great importance in yarn production. This stage includes several steps that can take a long time, affected by the efficiency of the spinning machines, which can differ from one factory to another, as well as the use of modern or traditional techniques and machines. Accordingly, many research studies have been conducted to address these challenges and improve the use of statistical methods and mathematical prediction equations. Consequently, numerous research studies have been conducted to address these challenges and optimize the use of statistical methods and mathematical prediction equations. The aim is to streamline the time consuming process of spinning cotton fiber and make informed decisions regarding the superiority of various model equations. These equations vary according to the type of cotton and the production location, establish relationships between fiber properties and yarn quality using regression and correlation equations, which serve as the cornerstone for these prediction models. In a study by Murthy and Samanta (2000), they presented Premium-Discount index (PDI) using a statistical method relating fiber properties to yarn properties. Majumdar.*et al*. (2005), comparison of traditional methods to determine technological value of cotton fibers. Several models have been used to evaluate the technological value of cotton and its effect on yarn properties. These methods contain the Fiber Quality Index (FQI), the Spinning Consistency Index (SCI), and the Premium Discount Index (PDI) In addition, a modern method based on Multiple-Criteria Decision-Making (MCDM) technique has been proposed .It has been observed that the decision maker plays a crucial part in determining importance of the criteria in the MCDM method .In their study, it was found that the Premium- Discount Index method exhibited the highest degree correlation between the technological value of cotton and yarn tenacity.

Ureyen and Kadoglu (2007*)*, also highlighted that the relationship between yarn properties as independent variables and fiber attributes as dependent variable showed a linear pattern for almost every yarn traits, so, multiple linear regression was elected as the preferred approach. Hussein and Ebaido (2011), indicated that fiber strength and fineness were the most influential fiber properties in predicting yarn properties for the Extra-long staple category under circular spinning system, on the other hand, the Upper Half mean length, FiberStrength and Maturity had the greatest effect on the properties of the studied yarns. Fares and Hassan (2015), found that all of the models assumed for the proposed regression models were significant and accounted for a large portion of the variance in the properties of the studied yarns .In a study by Mesbah and Hassan (2016), it was reported that there was highly significant positive correlation among vocabulary yarn strength, average top half, fiber strength and fiber elongation as percentage (%). Furthermore Abdel Daim *et al*. (2020), emphasized the importance of Fiber Strength, Upper half mean length, Uniformity Index and Short Fiber Index in determining the technological value of cotton, however, the influence of fiber fineness and fiber elongation was found to be relatively low in a Multi Criteria Decision Making (MCDM). Based on these findings, this study aimed to identify any fiber properties that positively impact cotton yarn traits and significantly contribute to the technological value of Giza 88 &Giza 90 as Extra-long staple Egyptian cotton varieties. Various analysis models were utilized for this purpose by predicting relations and correlations between fiber and yarn properties to get cotton yarn with high quality.

MATERIAL AND METHODS

This investigation was conducted during 2016 and 2017 seasons at Cotton Grade Section, Cotton Research Institute, Giza, Egypt to study the relationship between fiber properties and yarn quality traits (Lea product and Single yarn strength "cN/tex" at 60's and 80's yarn count under good grade for Extra-long Egyptian Cotton varieties (Giza 88 and 92), through using two models' analysis with the application of 3.6 twist multiply. The above treatments were arranged in complete randomize with3 repetitions. Eventually, it could be compared between the resulting cotton yarn from traditional spinning method and the prediction equations (FQI and MCDM) to obtain the technological value for each variety under study.

The studied traits:

These traits were determined by weighing log for each sample grade and variety.

Fiber quality properties:

Upper Half Mean Length (UHML) mm (X_1)

Length Uniformity percentage (U%) (X_2)

Short Fiber Content (SFC) (X_3)

Micronaire value (Mic.). (X_4)

Maturity Ratio (MR%) (X_5)

Fiber Strength (F.S. g/tex) (X_6)

Fiber Elongation (FE%) (X_7)

Were determined with using Cotton Classification System (CCS) and High Volume Instrument (HVI) Ebaido *et al.* (2017).

All fiber tests were carried out at the Grading Dep. at Cotton Res. Inst., Agric. Res. Center, under controlled conditions of 65% ± 2° relative humidity and temperature of 20 ± 2°, where cotton spinning process as Ring system (5 kg for each sample) on different yarn counts (60's and 80's) was spun in spinning unit of Industrial Menia El-Kameh El-Sharkia Governorate, Egypt.

Yarn quality properties:

To study the yarn quality traits, carded yarns of 20 tex liner density at twist factor (3.6) were spun from Extra-long staple Egyptian cotton varieties (Giza 88 and Giza 92) to determine the following yarn properties:

Lea product, (Y_1). It was measured by using Good Brand Lea tests according to ASTM (D-1598-93Roo).

Single yarn strength, (Y_2). It was estimated by using Uster Automatic, where 120 breaks were taken from the tested samples, according to ASTM (D-2256-67).

The statistical analysis:

The yarn quality was subjected to statistical analysis according to these prediction equations: -

Fiber quality index (FQI):-

This model had been chosen for its novel and simplicity.

FQI = UHM x UI x STRf x (1+EL) x (1-SF)/ MIC

El-Messiry (2015).

Multiplicative Analytic Hierarchy Process MCDM or (MI_{AHP})

It consists of fractional exponential equations including fiber properties (F.STR, F. EL, UHM, UI, Mic. and SFC.). The exponent for each fiber property defines its importance in quality of cotton fiber as follow: -

$$\boldsymbol{MI}AHP = \frac{STR^{0.27*}El^{0.039*}UHM^{0.291*}UI^{0.145}}{Mic^{0.11} * SFC^{0.143}}$$

RESULTS AND DISCUSSION

Results in Table (1) show the tested fiber properties due to Giza 88 and Giza 92 cotton varieties. Meanwhile, Table (2) displays the Rank correlation Matrix between the two model equations and yarn quality characters according to the studied yarn counts(60s&80s) for Giza 88 &Giza 92 produced using the ring spinning system, during 2016&2017 season.

For instance ,at a yarn count of 60s,the results in Table (2) report a highly significant positive correlation between Lea product and the application of MIAHP model equation for Giza 88 in 2016 and 2017 seasons (0.921**and 0.983**respectively), compared to 0.917 and 0.906 for FQI application in both seasons .Similarly the single yarn strength (SYS) showed a highly significant positive correlation (0.935**and0.965**) with both MIAHP &FQI models in both seasons, as for Giza 92,MIAHP model equation exhibited the greatest significant correlation (0,967** &0.969**) with Lea product in the first and second seasons respectively .

On the other hand, both FQI and MIAHP model equations recorded the highest correlation with SYS in 2016&2017 seasons (0.935 &0.938) respectively. The findings of this study align with the results obtained by Murthy and Samanta (2000) who highlighted the significance of the Fiber Quality Index as an early attempt by Lord (2000) to create a comprehensive measure of cotton yarn quality. The popularity of FQI can be attributed to its simplicity and the availability of various FQI model variants. Additionally, Ureven and Kadoglu (2007) discovered a nearly liner correlation between yarn properties as independent variables and fiber traits as dependent variables for each yarn property. The results of stepwise liner regression analysis, focusing on Lea product and Single yarn strength for Extra-long Egyptian Cotton fiber properties under study, are presented for 2016&2017 seasons, especially for two yarn counts (60s &80s). These results can be found in Tables 3, 4,5and 6.

The outcomes indicate to the proposed multiple regression models significantly contributed to the variability of the two yarn properties mentioned above .The goodness of fit was statistically satisfactory for each multiple regression model ,cotton variety and yarn count as more than 80% of Lea product and Single yarn strength could be associated with fiber properties for both yarn counts .It is worth noting that, there was a negative relationship between the examined yarn properties and certain fiber ones, which varied between cotton cultivars in the first season. The contribution of most fiber properties to yarn quality traits was at the 60s yarn count for both Giza88 and Giza92 varieties. This trend was also observed at the 80s yarn count for the same varieties in 2016 season. (Table,3).

Significant contributions had been detected for the studied models that included certain fiber properties towards yarn count at 60s yarn count. The R^2 ranged from 0.8287 up to 0.9736% except for Y2M2 which had an F value of 22.28 for Giza 88 var. Similarly, at 80s Y.c, all the studied models showed significant contributions. For instance, the data for SYS indicated the highest contribution of 0.9882, with an F value of 0.195 for Giza 92 var.

The residuals content ($1-R^2\%$) perhaps attributed to some errors during estimating the fiber and yarn properties, the exclusion of certain fiber properties in the current investigation or unknown variation (random error). Notably, the adjusted R^2 closely matched their corresponding indicating a good fit for the models. These findings align with previous studies by Hagar *et al* (2011), Fares and Hassan (2015) and Abdel-Daim *et al* (2020),which emphasized the importance of Upper Half Mean Length (UHML), Fiber Strength (FS),Uniformity index and Short Fiber index in determining the technological value of cotton using Multi Criteria Decision Making (MCDM)models

Concerning the stepwise multiple linear regression, results in Tables (5 and 6) highlight that the specific properties of cotton fiber significantly accounted for the variation in Lea product (Y1) at a 60s count with Giza 88 var. These properties included Upper Half Mean Length (UHML)(X1), Short Fiber Content (SFC) (X3), and Micronaire value (Mic) (X4), which resulted in the maximum R2 value of 94.46% during 2016 season.

Similarly, for single yarn strength (Y2) at an 80s count, the important fiber traits for Giza 88 var. were X4, X6 and X7, resulting in the highest R2 value of 0.972%. For Giza 92 var., the important fiber traits were X4,X6 and X3 leading to maximum R2 value of 0.956%.

The significant contributors to Lea product (Y1) at 60s count for both Giza 88 and Giza 92 varieties were UHML (X1),SFC (X3),FS (X6),UI (X2),SFC (X3) and Mic (X4)which aimed to achieve the maximum R2 values in the second season, as shown in Table 4.

Similarly, for Single Yarn Strength (Y2)at 80s count, the significant fiber traits for both varieties were SFC (X3),Mic (X4),FS (X6) and UHM (X1) in the first season .In the second one, the significant fiber traits for Giza 88 and Giza 92 were UHML(X1),SFC (X3),FS (X6),UI % (X2) and Mic (X4) respectively, resulting in maximum R2 values of 0.948 &0.988,concequantly.These findings are supported by Fares *et al*(2010),Mesbah and Hassan (2016)and Younes *et al*(2021) which emphasize the importance of Upper Half Mean Length, Fiber Strength ,Fiber Elongation and Maturity percent in predicting yarn properties and technological value for Extra-long staple on different yarn counts .The results indicate that the regression models used were significant and explained a large portion of the variation in the studied yarn traits, as evidenced by high R^2 values and close ones of the corresponding adjusted R^2 indicating the validity and goodness of fit for these models.

Consequently, these results assist spinners in predicting spinning performance by utilizing available fiber properties to achieve the highest yarn quality. Additionally, they aid in selecting the best model equation to express the technological value for any cotton variety using Multiple Analytic Hierarchy process, which relies on the relational scale of numbers, pair- wise matrix, relative importance, alternative scores and Eigen value.

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Table 1: The differences between the two Extra Long Egyptian cotton varieties due to their fiber properties during 2016 and 2017 season.

Var	G	U.H.M (mm)	UI%	SFC	MIC	MR%	F.S (g/tex)	FE%	Rd%	+b	Tr_b	Tr_a
2016 Season												
G.88	FG	35.24	86.57	3.64	4.10	0.88	48.30	7.43	64.13	11.73	0.98	0.18
	G	34.73	85.87	4.74	3.93	0.86	45.47	7.13	60.77	11.70	1.72	0.35
	FGF	34.35	84.27	7.63	3.77	0.84	41.80	7.00	58.43	12.00	3.49	0.79
	GF	33.40	82.60	9.87	3.58	0.80	38.63	6.85	54.77	11.63	5.67	1.41
	2017 Season											
	G	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	FG	35.04	85.87	3.26	4.21	0.89	47.27	8.90	65.50	11.60	1.03	0.18
	G	34.68	85.27	4.74	4.12	0.87	44.97	8.50	63.33	11.80	1.93	0.38
	FGF	33.53	83.67	6.17	3.86	0.84	41.93	8.17	60.03	12.13	3.76	0.82
	GF	32.71	81.77	9.76	3.68	0.80	38.60	7.12	56.70	11.80	5.84	1.35
2016 Season												
G.92	G	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	FG	34.21	85.73	4.25	3.66	0.88	44.70	8.37	74.60	8.90	1.08	0.19
	G	33.91	84.80	5.69	3.57	0.86	42.80	7.43	71.87	8.77	2.96	0.60
	FGF	32.95	83.53	7.79	3.45	0.83	39.13	6.20	70.43	9.43	4.24	0.91
	GF	31.87	82.47	9.04	3.24	0.80	36.47	6.06	69.00	9.43	6.11	1.37
	2017 Season											
	G	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	FG	33.88	85.40	2.98	3.79	0.89	44.20	8.57	74.40	8.23	1.14	0.20
	G	33.31	84.77	4.03	3.55	0.86	42.53	8.37	72.90	8.80	2.59	0.48
	FGF	32.53	83.00	5.21	3.35	0.84	39.33	7.67	70.57	9.13	4.11	0.90
	GF	31.52	81.90	6.38	3.28	0.79	36.80	6.63	66.93	9.33	6.11	1.41

Table 2: Rank correlation matrix between the two models' equations for lea product (Lp) and Single yarn strength (SYS)at 60s yarn count for Giza88 and Giza92 var. (Extra-long staple varieties) during 2016 and 2017 seasons.

arieties	Modern equation	Lp		SYS	
		2016	2017	2016	2017
Giza88	FQI	0.917	0.906	0.916	0.965*
	MI_{AHP}	0.921*	0.983*	0.935*	0.925
Giza92	FQI	0.962	0.843	0.935*	0.859
	MI_{AHP}	0.967*	0.969*	0.926	0.938*

Table 3: Stepwise multiple linear regression analysis of lea product and Single yarn strength (cN/tex) at 60's yarn count for Giza 88, and Giza 92 varieties during 2016.

Yarn properties	model	Prediction equation	Goodness of fit		
			R^2%	F Value	Sig.
Extra-Long Staple (E-LS)					
Lp (Y_1)	G.88	M_1= 423.34137+759.46849 MIC	0.911	92.18	<.0001
		M_1= 1600.51278 -23.53036 SFC + 493.07335 MIC	0.936	58.56	<.0001
		M_1=3741.59345-80.54411UHM-30.97305SFC+670.22863MIC	0.946	41.39	<.0001
	G.92	M_1= 3799.21394 -69.92491 SFC	0.903	83.84	<.0001
		M_1= 3355.07594-47.26688 SFC+ 41.20684 FE	0.921	47.18	<.0001
		M_1= -3674.34361- 46.28767 UHM+96.88455 UI+55.92385 FE	0.939	36.00	<.0001
SYS (Y_2)	G.88	M_2= -12.12238+ 0.73344FS	0.836	46.11	<.0001
		M_2= -22.09880 + 0.55636 FS+ 2.47786 FE	0.860	24.74	0.0004
		M_2= 24.52810 -1.75025 UHM+ 0.85452 FS+ 2.56900 FE	0.878	16.83	0.0014
	G.92	M_2= -3.85450 + 0.62965 FS	0.967	270.7	<.0001
		M_2= 12.33177 -0.55194 SFC+ 0.32370 FS	0.981	215.1	<.0001
		M_2= 11.75696 -0.60678 SFC+ 1.40860 MIC+ 0.22663 FS	0.986	172.4	<.0001

M_1, M_2 M_3 equal $Model_1$, $Model_2$ and $Model_3$

Explanatory variables: -

X_1	Upper Half Mean Length (UHML)mm	X_5	Maturity Ratio (MR%)
X_2	Length uniformity Percentage (UI)%	X_6	Fiber strength (FS g/tex)
X_3	Short Fiber Content (SFC)	X_7	Fiber Elongation (FE %)
X_4	Micronaire value (Mic)		

Table 4: Stepwise multiple linear regression analysis of lea product and Single yarn strength (cN/tex) at 80's yarn count for Giza 88 and Giza 92 varieties during 2016.

Yarn properties	model	Prediction equation	Goodness of fit		
			R^2%	F Value	Sig.
Extra-Long Staple (E-LS)					
Lp (Y_1)	G.88	M_1= 12.89323 +841.37362 MIC	0.952	181.9	<.0001
		M_1= -223.79855 + 718.22358 MIC+99.46710 FE	0.967	120.2	<.0001
		M_1= 98.72294 + 568.60035 MIC+ 10.55561 FS+ 70.44701 FE	0.972	82.01	<.0001
	G.92	M_1= -1856.66667+5965.76577 MR	0.925	111.2	<.0001
		M_1= -589.27120+ 3907.64836 MR + 66.63488 FE	0.952	80.19	<.0001
		M_1= 102.32000 + 2340.82917MR+14.82041 FS +70.64629 FE	0.955	50.52	<.0001
SYS (Y_2)	G.88	M_2= -16.53750+ 0.81628FS	0.837	46.21	<.0001
		M_2= -27.64273+ 6.77398 MIC + 0.47379 FS	0.855	23.67	0.0004
		M_2= -36.76522 + 7.12069 MIC + 0.30443 FS+ 2.12459 FE	0.869	15.58	0.0018
	G.92	M_2= -40.68333+ 72.85586 MR	0.974	345.8	<.0001
		M_2= -12.32058--0.54062SFC+ 43.60000 MR	0.993	652.1	<.0001
		M_2= -21.88813 +0.37782 UHM -0.42681 SFC + 39.14717 MR	0.995	548.7	<.0001

M_1, M_2 M_3 equal $Model_1$, $Model_2$ and $Model_3$

Explanatory variables: -

X_1	Upper Half Mean Length (UHML)mm	X_5	Maturity Ratio (MR%)
X_2	Length uniformity Percentage (UI)%	X_6	Fiber strength (FS g/tex)
X_3	Short Fiber Content (SFC)	X_7	Fiber Elongation (FE %)
X_4	Micronaire value (Mic)		

Table 5: Stepwise multiple linear regression analysis of lea product and Single yarn strength (cN/tex) at 60's yarn count for Giza 88 and Giza 92 varieties during 2017.

Yarn properties		model / Prediction equation	Goodness of fit		
			R^2%	F Value	Sig.
Extra-Long Staple (E-LS)					
Lp (Y_1)	G.88	M_1=1324.91108+47.23958 FS	0.941	145.3	<.0001
		M_1= -607.88532 +84.05377 UHM+ 25.90984 FS	0.961	99.12	<.0001
		M_1=-2350.21583+112.12505+UHM+31.29998SFC+39.78074FS	0.973	*86.15*	<.0001
	G.92	M_1= 1376.68249 + 560.08615 MIC	0.870	60.68	<.0001
		M_1= 2307.34084 -44.36077 SFC+ 353.71641 MIC	0.964	110.0	<.0001
		M_1= -3221.27860-12.38078 UI-50.37611 SFC+396.93765 MIC	0.967	*69.02*	<.0001
SYS (Y_2)	G.88	M_2= -14.81949+ 0.80465FS	0.828	43.54	<.0001
		M_2= -52.11111+ 1.06417 SFC+ 1.51844 FS	0.879	29.30	0.0002
		M_2= -99.66812 + 1.65344 SFC+ 57.40144MR+1.41140 FS	0.905	*22.28*	0.0006
	G.92	M_2= -52.55776+ 2.26582 UHM	0.964	241.1	<.0001
		M_2= -35.22786+ 1.41562 UHM + 0.25876 FS	0.979	188.1	<.0001
		M_2= -31.58084 + 0.99192 UHM+ 13.52677 MR+ 0.23075 FS	0.985	*156.3*	<.0001

M_1, M_2 M_3 equal $Model_1$, $Model_2$ and $Model_3$

Explanatory variables: -

X_1	Upper Half Mean Length (UHML)mm	X_5	Maturity Ratio (MR%)
X_2	Length uniformity Percentage (UI)%	X_6	Fiber strength (FS g/tex)
X_3	Short Fiber Content (SFC)	X_7	Fiber Elongation (FE %)
X_4	Micronaire value (Mic)		

Table 6: Stepwise multiple linear regression analysis of lea product and Single yarn strength (cN/tex) at 80's yarn count for Giza 88 and Giza 92 varieties during 2017.

Yarn properties		model / Prediction equation	Goodness of fit		
			R^2%	F Value	Sig.
Extra-Long Staple (E-LS)					
Lp (Y_1)	G.88	M_1= 1053.18213 + 50.85732 FS	0.920	103.8	<.0001
		M_1= 100.48842 + 2032.37079 MR + 33.07346 FS	0.934	57.13	<.0001
		M_1= -1725.06783 +34.77208SFC+3327.37517MR+45.06503FS	0.943	39.29	<.0001
	G.92	M_1= -1093.59046 + 5071.52875 MR	0.908	88.81	<.0001
		M_1= 367.66914 -46.01352 SFC+ 3592.51361 MR	0.942	65.41	<.0001
		M_1=590.18342-43.42788SFC+282.93275MIC+2139.33485MR	0.942	65.41	<.0001
SYS (Y_2)	G.88	M_2= -89.71595 + 3.20738 UHM	0.896	78.09	<.0001
		M_2= -57.21989 + 1.72267 UHM+ 0.41506 FS	0.916	43.72	<.0001
		M_2= -109.11003 + 2.55869 UHM+ 0.93218 SFC+ 0.82816 FS	0.948	42.76	<.0001
	G.92	M_2= -70.02607+2.77345 UHM	0.954	188.4	<.0001
		M_2= -97.63079 +1.52563 UHM+ 0.81808UI	0.984	253.1	<.0001
		M_2= -87.21559 +1.45024 UHM + 0.66138 UI + 1.48250 MIC	0.988	195.9	<.0001

M_1, M_2 M_3 equal $Model_1$, $Model_2$ and $Model_3$

Explanatory variables: -

X_1	Upper Half Mean Length (UHML)mm	X_5	Maturity Ratio (MR%)
X_2	Length uniformity Percentage (UI)%	X_6	Fiber strength (FS g/tex)
X_3	Short Fiber Content (SFC)	X_7	Fiber Elongation (FE %)
X_4	Micronaire value (Mic)		

تقدير القيمة التكنولوجية لصنفي القطن جيزة 88 وجيزة 92 باستخدام نموذجي التحليل الرياضي

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الملخص العربى

أجريت هذه الدراسة بمعامل قسم رتب القطن، معهد بحوث القطن ،مركز البحوث الزراعية بالجيزه ج م ع وبوحدة الغزل بالمدرسة الصناعية بمنيا القمح محافظة الشرقيه خلال عامي 2016و2017 لتوضيح العلاقات فيما بين صفات ليفة القطن والأخرى الخيطية عند إجراء الغزل الحلقى على نمر 60 ،80 لصنفى القطن فائق الطول (جيزة 88 ،جيزة92) رتبة جود مع استخدام معامل برم ثابت 3.6 ,وقد تم الاستعانة بنموذجين رياضيين للتحليل وهما معامل الجودة والتحلل الهرمى التسلسلي . ولقد أوضحت النتائج أن هناك ارتباط موجب عالي المعنوية فيما بين نموذج التحلل الهرمى التسلسلى وكلا من صفتى الخيط المختبرة وذلك فى كلا صنفي القطن خلال موسمي الدراسة.كما بينت النتائج أن كلا من محتوى الليفة من الشعيرات القصيرة ومتوسط طول أطول الشعرات والمتانةوقيم الميكرونيركانوا أعلى الصفات رقميا مساهمة فى الصفات قيد الدراسة ، وعلى نفس المنوال فإن كل نماذج الانحدار اتسمت بالمساهمةالمعنوية لمتغيرات الغزل ، وقد أشارت الدراسة إلى أن استخدام النماذج الرياضية والتي تعبر عن مساهمة صفات الليفة فى جودة صفات الخيط إنما تتسم بالمصداقية والقرب من الواقع العملى.

الكلمات الاسترشادية: القطن ، القيمة التكنولوجية ، القطن المصري الطويلة ، نماذج التحليل الاحصائى