EVALUATION OF EGYPTIAN COTTON FIBRES CHARACTERISTICS AND THEIR PERFORMANCE IN SPINNING PREPARATIONS USING "AFIS"

تقييم خواص الأقطان المصرية وسلوكها فى تحضيرات الغزل باستخدام جهاز تحليل الشعيرات AFIS

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خلاصة

يهدف هذا البحث إلي الاستفادة من جهاز "ايفس" (Afis) فى قياس خواص شعيرات الأقطان المصرية. حيث تم اختبار خواص الشعيرات لعدد ١١ لوط من ستة أنواع مختلفة من الأقطان المصرية ، أربعة خلطات ، بالإضافة إلي قطن سورى . ثم تم التشغيل فى خطوط تفتيح وتنظيف وكرد مختلفة لانتاج شريط مسرح . وتم تقييم الخواص فى القطن الخام وفى شريط الكرد . وتشير النتائج إلي أن تكون العقد فى معظم الأقطان المصرية تقع عند مستوى ٥ ، ٢٥% من إنتاج العالم . كما وجد أن نسبة العقد التى تحتوى على أجزاء من قشرة البذور بالنسبة للعدد الكلى للعقد حوالى ٤ % . وأن نسبة العقد والعقد التي تحتوى على أجزاء من قشرة الدرة المتبقية فى شريط الكرد تكون حوالى ٤٦,٣٥% و ٤٢,٨ % على التوالى. ويشير التحليل الإحصائى إلي وجود ارتباط عكسى بين عدد العقد/جرام و دقة الشعيرات وارتباط طردى بينها وبين نسبة الشعيرات الغير ناضجة ولايوجد أى ارتباط بينها وبين باقى الخواص المختبرة . أما بالنسبة للعقد التى تحتوى على أجزاء من قشرة البذرة فالارتباط بينها وبين شوائب القطن (الأتربة , القشور والمواد الغريبة المنظورة) طردى . أما بالنسبة للشوائب المتبقية فى شريط الكرد فوجد أن هناك ارتباط عكسى بينها وبين متوسط طول الشعيرات وأن هناك ارتباط طردى بينها وبين معامل الاختلاف فى طول الشعيرات . وباجراء تحليل الانحدار تم التوصل الى معادلات يمكن بواسطتها التنبؤ بعدد العقد الموجودة فى القطن الخام

ABSTRACT

In the present study the authors intended to evaluate the performance and properties of different lots of Egyptian cotton fibres using AFIS system. Cottons were processed in different blowroom lines and carding. Fibre properties of raw cotton and card sliver were examined by AFIS system. Analysis of results showed that, for Egyptian cottons, the percentage of seed coat neps to total neps is about 4%. Egyptian cottons contain low nep count, where the majority of cottons corresponded to 5 and 25% of world level according to Uster Statistics, but are characterized by high trash content, since the majority corresponded to 75 and 95% of world level. By opening and carding higher percent of trash is extracted, where the residual in card sliver is 5.5, 4.5 and 3.7% for dust, trash and visible foreign matter. Statistical analysis showed that there is a correlation between nep count/g and both of fibre denier (r is –ve) and immature fibre content (r is +ve). Moderate correlation was found between seed coat neps and cotton impurities. Also linear correlation was found between trash residual in card sliver and fibre length parameters of raw cotton. Regression analysis were carried out, where regression equtions has been found to predict nep and seed coat nep content in raw cotton.

I- INTRODUCTION

Full knowledge of fibre properties and changes in these properties during processing stages enables in predicting yarn properties

B.Xu et al (1) stated that trash in cotton refers to nonlint particles such as leaf, seed coat, grass, dust and other foreign matter and reported that yarn breakage during spinning increased by approximately 60% with 1% increase in bark content. Also correlation was found between the number of seed coat fragments and yarn imperfections. The presence of trash degrades yarn evenness, yarn strength, fabric appearance and causes problems in textile processing. Anthony et al (2) stated that seed coat fragments account for 27% of yarn imperfections. Since different trash categories may have different influences in textile

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processing of cotton and the quality of finished products, the amount of nonlint material or trash in cotton is one important criterion for determining cotton quality.

Klien et al (3) stated that, in the spinning process, the spinner begins not at zero but far below this. Since cotton in the boll is pure and almost without short fibres (1 to 4%), i.e., with high utility value. However in the two first process stages of spinning industry, picking and ginning, there is no qualitative upgrading as the cotton spinner ought to expect, but a marked deterioration in the utility value. Among other things there is: shortening of a considerable portion of the fibres, sometimes up to 25% short fibre content (SFC), also contamination of the cotton with different foreign matter, and commination of these particles to very small size, making them very difficult to eliminate. Anthony et al (6) stated that harvesting producers and ginning techniques can contribute to fibre variability by altering short fibre content (percent of fibres less than 12.7 mm long) and nep count.

Robert et al (4,5) stated that cotton's ability to open and release its foreign matter in response to mechanical cleaning treatment is a crucial concern for the textile processing industries. In their studies processing quality is expressed in terms of a trade-off between reduction in foreign matter on the other hand and accumulation of the fibre damage on the other hand. This trade-off between cleaning and damage governs the efficiency of manufacture as well as the quality of textile product.

Neps are small entanglements of cotton fibres created during boll development, harvesting, handling, ginning and mill processing. They are highly undesirable because they decrease processing efficiency, dye improperly, and detract from the appearance of fabric.

Hebert et al (7) classified neps into three groups based on observation a polarizing microscope: (a) entangled fibres attached to a seed coat fragment, (b) fibre entangled about a trash particles, and (c) entangled fibres with no nonfibrous material present. Nep count increased as the perimeter of individual fibre decreased independent of maturity and micronair. Matusiak et al (8) concluded that linear correlation was found between nep count in cotton and other fibre parameters assessed on the AFIS system, mostly characterizing length and maturity. While Hebert et al (9) stated that 13% of all neps contained seed coat fragments.

Mangialardi (10) studied the effect of lint cleaning at gins on the number, weight, and size of seed coat fragments in cotton and concluded that lint cleaning has a little effect on the number of fragments in the lint, although it shift their size distribution toward the smaller fragments.

Robert et al (5) stated that one of the most important cotton's fibre properties is cleanability, it very difficult to determine objectively , and added that there are three main influences on cleanability: intrinsic properties of the native cotton, the nature of the machine process employed and the processing history of the cotton prior to the cleaning stage being characterized. Included the nature and history of cotton, the nature of the foreign matter and its particle size distribution.

So by introducing a raw material whose basic fibre properties were evaluated adequately yarn properties can be expected. In the last ten years a quick and reliable method of investigating cotton quality using Zellweger-Uster Advanced Fibre Information System (AFIS) was introduced. Studies (11,12,13 14,15) were carried out for evaluating AFIS fibre properties and making a comparison between AFIS results and other measurements.

In this work different raw cottons were used and processed in different opening and carding producing card sliver. Properties of raw material and card sliver were measured using AFIS system. Then evaluating these properties to find the influence of fibre parameters and processing variables on the behavior of fibres in carded sliver. .

2-EXPERIMENTAL WORK

2-1 MATERIALS AND METHOD

Different cotton lots from six different Egyptian cottons, in addition to Syrian cotton were processed in different blowroom lines and carding producing 27 card sliver. Sample identification and processing variables for each sample are listed in Table (1) and Table (2).

Table (1) Sample identification and processing variables code

No.	Cotton type	Processing variables code
1	G70, lot 301	(7)
2	G70, lot302	-
3	G70, lot303	-
4	G70, 302/303 (70%/30%)	(2)
5	G89, lot 901	(1-A), (1-B), (1-C), (3), (5), (9)
6	G89, lot902	-
7	G86, lot 601	(1-A), (2), (4)
8	G86, 601/602 (50%/50%)	(2)
9	G85, lot 501	(8), (9)
10	G85, lot 502	-
11	G85, lot 503	-
12	G85, 501/502/503 (81.25%/12.5%/6.25%)	(8), (9)
13	G83, lot 201	(4), (5), (6), (9)
14	G80, lot 101	(1-B), (2), (4), (6)
15	G80, 101/102 (50%/50%)	(6), (4)
16	Syrian	(9)

2-2 MEASUREMENTS AND EVALUATION

Raw cotton and card sliver were examined by AFIS for the following properties

- nep content (nep cnt/g),
- seed coat nep content (SCN/g),
- mean fibre length by weight,
- coefficient of variation of fibre length,
- short fibre content, i.e, percentage of fibres <1/2 inch by weight (SFC%),
- immature fibre content (IFC%),
- number of trash particles (>500 micron) per gram (trash cnt/g),
- number of dust particles (<500 micron) per gram (dust cnt/g), and
- visible foreign matter content (VFM%).

Quality of raw cottons used in the present investigation is shown in Table (3), while fibre properties of carded sliver is shown in Table (4). Also residual %age of neps and impurities after spinning preparation " blowroom and carding" is shown in Table (5).

3-RESULTS AND DISCUSSION

Uster Statistics at 25% (for fibre parameters in carded sliver) of world level is represented by broken lines in Fig.(1) and the experimental results "fibre parameters"of raw cotton and carded slivers are illustrated graphically in Figures (1) to (7) indicated the following:

3-1 Nep content

As shown in Table (3) seed coat neps is the highest for Syrian cotton. For Egyptian the highest value is for G83 (201), G70 (302/303) and G80 (101/102). The lower seed coat nep content was found for G89 (901). Also for Egyptian cottons, the percentage of seed coat nep content to total nep content is ranged from 3.43% for (G7,301) to 6.96%

Table (2) Processing variables of blow room and carding

Processing variables code	Blow room components	Carding variables
(1-A)	(Trutzschler) Blendomat, separatronic, Bre-mixer, Axi-flo, Pre-cleaner, Step cleaner, Porcupine, Multimixer, RVcleaner (full spik roller).	(Rieter), NT.I=990rpm Ncyl-380rpm Ndoffer=55rpm Flats speed=25cm/min
(1-B)	as (1-A)	(Rieter), NT.I=934rpm Ncyl.=380rpm Ndoffer=34rpm Flats speed=25cm/min
(1-C)	as (1-A)	(Rieter), NT.I=934rpm Ncyl.=380rpm Ndoffer=45 rpm Flats speed=20cm/min
(2)	(Trutzschler) Blendomat, Separatronic, bale breaker, Axi-flo, Multimixer, Separomat, Porcupine, RST cleaner, Dustex	(Trutzschler DK740) NT.I=950rpm Ncyl.=365rpm Ndoffer=41rpm Flats speed=17cm/min
(3)	(Trutzschler) Super bale opener, Axi-flo, Feed box , Step cleaner, Porcupine, Multimixer, Kirschner	(Platt), NT.I= 950 rpm Ncyl.= 270 rpm Ndoffer= 24 rpm Flats speed= 7.6 cm/mi
(4)	Opening and cleaning m/c (AMH), Automixer (Rieter), Axi-flo (Whitin), Porcupine 1 and 2 (Sacolowell). Kirschner (Trotusczler)	The same as in (3)
(5)	Opening and cleaning m/c(Textima), Automixer(Rieter), Axi-flo(Whitin), Pocupine (1)and (2) (Sacolowell) Kirschner (Trotusczler).	The same as in (3)
(6)	(Rieter) Blending bale opener, Striker (A), Vertical opener, Striker (B), Porcupine (1), Porcupine (2), Scutcher lap machine (2-bladed and Kirschner)	(Platt Saco Lowell) NT.I= 440rpm Ncyl.=180rpm Ndoffer= 8.5 rpm Flats speed=8.5 cm/min
(7)	(Rieter) , preopenine m/c, Automixer, Striker(A), Striker (B), Hopper feeder, Porcupine(1) and (2), Hopper feeder Scutcher lap m/c (2-bladed beater and Kirschner)	(Platt Saco Lowell) NT.I= 440 rpm Ncyl.= 180 rpm N doffer= 5.7 rpm Flats speed=10 cm/min
(8)	(Trutzschler) Blendomat , Separatronic , Bale breaker , Axi-flo, Automixer , Separomat , Porcupine , CVT3 cleaner, Dustex	(TrutzschlerDK 760) NT.I= 950 rpm Ncyl.= 366 rpm Ndoffer= 42 rpm Flats speed=17 cm/min
(9)	(Trutzschler) Super bale opener, Axi-flo, Condenser, Hopper feeder, Step cleaner, Porcupine, Multimixer, Condenser, Kirschner,	(Platt Saco Lowell) NT.I= 935 rpm Ncyl.= 265 rpm Ndoffer= 24.5r pm Flats speed=8cm/min

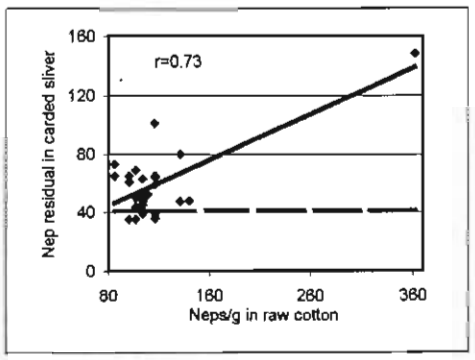


Fig.(1-1) Nep count/g

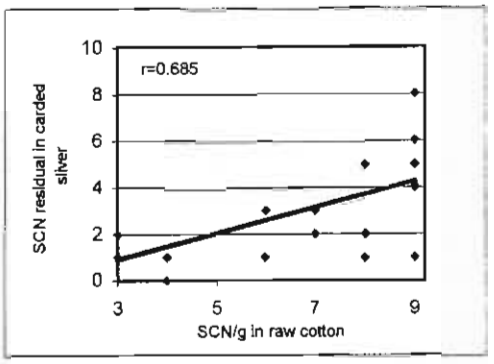


Fig.(1-2) SCN/g

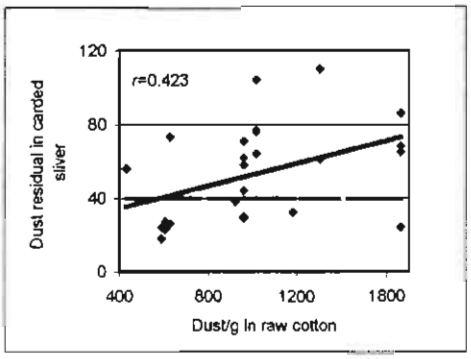
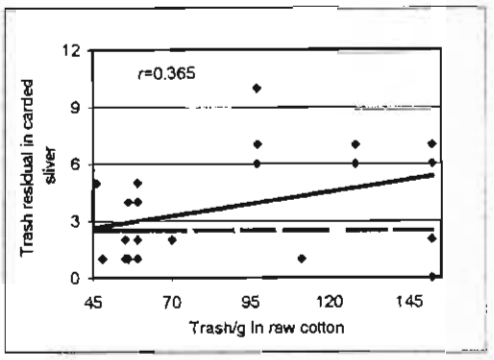


Fig.(1-3) Dust count/g



Fig(1-4) Trash count/g

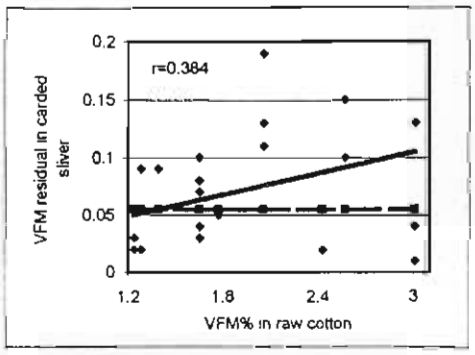


Fig.(1-5) Visible foreign matter(%)

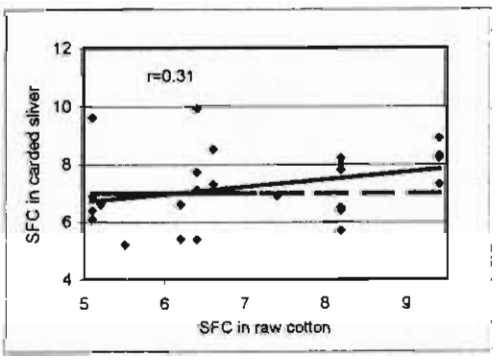


Fig.(1-6)Short fibre content(%)

Fig.(1) Relationship between properties of raw cotton and carded sliver

Table (3) properties of raw cotton by AFIS

Cotton type	Total nep cnt /g			Mean fibre length		SFC (%)	Fineness (mtex)	IFC (%)	IMPURITIES		
	Neps	SCN		L (mm)	C.V (%)				Dust/g	Trash/g	VFM%
		count	(%)								
G70(301)	160	4	2.43	36.8	33.1	5.5	155	6.1	923	70	1.77
G70 (302)	164	4	2.38	36.6	33.3	5.6	153	6.3	994	68	1.58
G70 (303)	248	6	2.36	36	35.3	6	151	6.8	1273	92	2.19
G70* (302/303)	382	9	-	36.8	32.3	7.4	143	8.8	1182	111	2.43
G89(901)	114	3	2.56	31.9	35.9	8.2	157	5.7	961	59	1.65
G89(902)	134	5	3.6	32.8	34.4	7.1	162	5.8	793	69	1.6
G86* (601)	100	7	6.54	33.9	31.8	5.1	165	5.7	589	55	1.24
G86** (601/602)	119	4	-	32	34.6	5.2	166	5.1	431	46	1.39
G85(501)	151	6	3.82	29	35.5	6.6	156	6.1	627	56	1.28
G85(502)	167	7	4.02	29.6	33.2	8.2	152	6.8	997	76	1.7
G85(503)	207	9	4.17	30.3	36.3	9	153	7.2	1021	59	1.43
501/502/503	126	4	3.08	30.6	33.2	6.2	159	6	605	48	1.28
G83(201)	126	9	6.66	29.6	35.8	9.4	167	5.9	1017	97	2.06
G80(101)	107	8	8.96	32.9	32.7	6.4	169	5.9	1664	152	3.01
G80(101/102)	86	9	-	33.4	30.9	5.1	170	5.8	1303	128	2.57
Mean value	159.4	6.27	3.93	32.81	33.89	6.73	158.5	6.27	959	79	1.81
Syrian	200	20	10	29	32.5	6.5	170	5.7	587	109	2.3

Table (4) properties of card sliver by AFIS

Cotton type and (processing code)	Total nep cnt/g		Mean fibre length		SFC (%)	IFC (%)	Dust/g	Trash/g	VFM (%)
	Nep	SCN	L(mm)	C.V(%)					
301(7)	48	1	36.8	33.1	5.2	6.8	38	2	0.05
302/303 (2)	148	1	35.2	36.1	6.9	8.6	32	1	0.02
901 (1-A)	47	1	32.1	35.8	8.2	5.9	29	1	0.03
901 (1-B)	39	1	32.9	34.1	6.4	5.8	30	1	0.03
901 (1-C)	49	1	32.3	35.5	7.8	6	44	2	0.04
901 (3)	63	2	32.3	35.5	8	5.8	62	4	0.08
901 (5)	45	2	33	33.7	6.5	5.3	58	4	0.07
901 (9)	52	2	33.1	33	5.7	5.6	71	5	0.1
601 (1-A)	35	1	34.3	33.7	6.1	6.4	18	2	0.03
601 (2)	61	2	32.8	34.3	6.9	6.4	18	2	0.03
601 (4)	65	3	33.4	34.3	6.4	5.1	24	1	0.02
601/602 (2)	52	1	33.2	32.3	6.6	5.7	56	5	0.09
501(8)	47	1	29.9	34.9	7.3	6.8	26	1	0.02
501 (9)	80	3	29.2	33.9	8.5	6.8	73	4	0.09
501/502/503 (8)	39	1	30.5	33.9	6.6	6.3	27	1	0.02
501/502/503 (9)	36	0	30.7	32.8	5.4	6	23	1	0.02
201 (4)	59	5	29.9	35.8	8.9	6.3	104	6	0.13
201 (5)	65	4	30.2	35.2	8.2	6.1	77	6	0.11
201 (6)	101	8	31	35.6	8.3	6.9	76	10	0.19
201 (9)	64	4	30.6	34.4	7.3	6.5	64	7	0.11
101 (1-B)	50	2	31.1	37	9.9	6.9	65	2	0.04
101 (2)	35	1	31.5	35.9	7.7	5.9	24	0	0.01
101 (4)	44	5	32.9	32	5.4	6	86	6	0.13
101 (6)	69	5	31.1	33.7	7.1	6.7	68	7	0.13
101/102 (6)	65	5	32.28	32.6	6.1	6.6	61	6	0.1
101/102 (4)	73	6	31.2	36.7	9.6	6.8	110	7	0.15
Syrian (9)	99	19	29.4	35.8	9	6.3	107	15	0.27

SCN=seed coat neps. IFC=immature fibre content. SFC= short fibre content. VFM= visible foreign matter

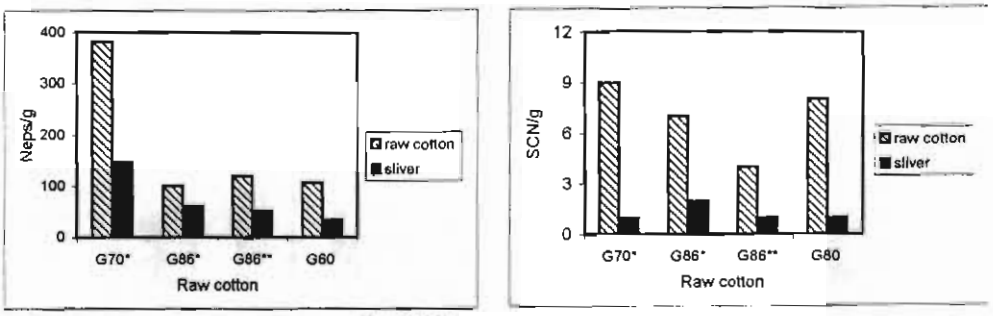


Fig. (2-1) Neps and seed coat neps

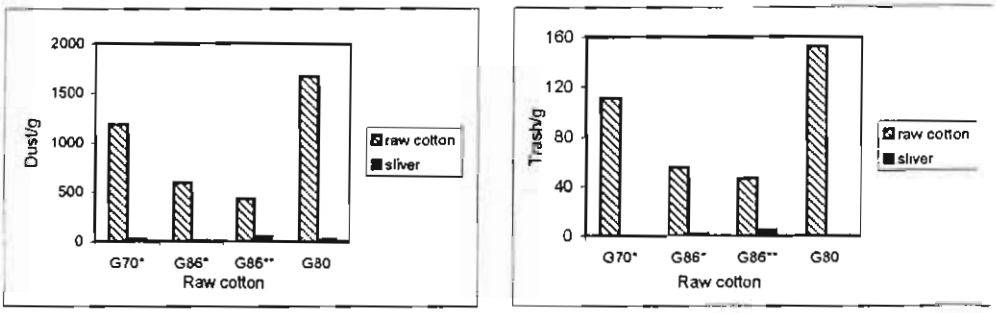


Fig. (2-2) Dust and trash

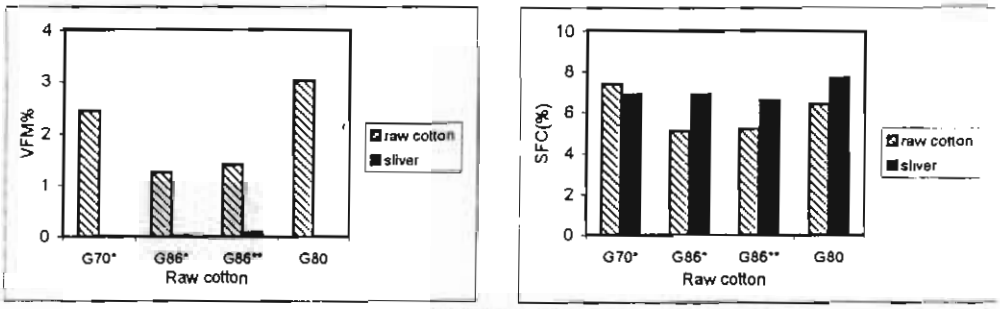


Fig.(2-3) Visible foreign matter and short fibre content

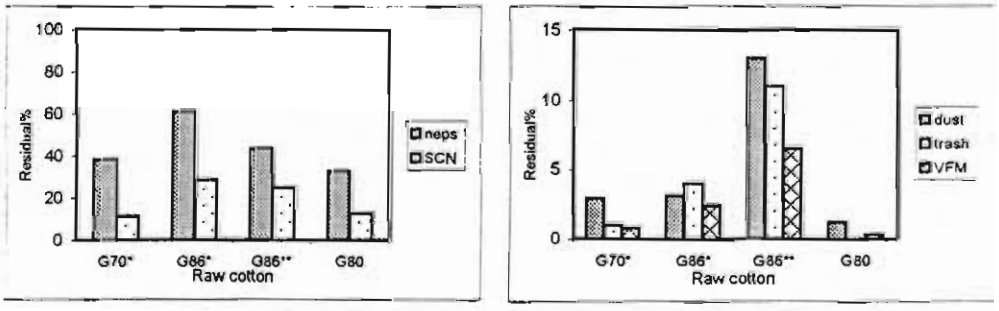


Fig (2-4) Residual%

Fig.(2) Properties of raw cotton and card sliver processed on line (2)

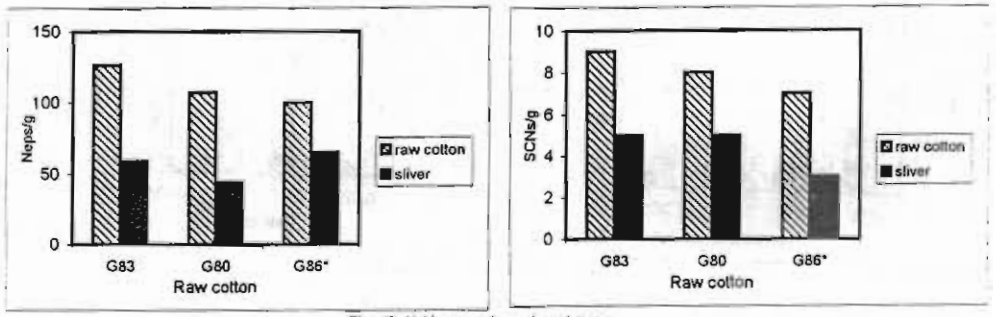


Fig. (3-1) Neps and seed coat neps

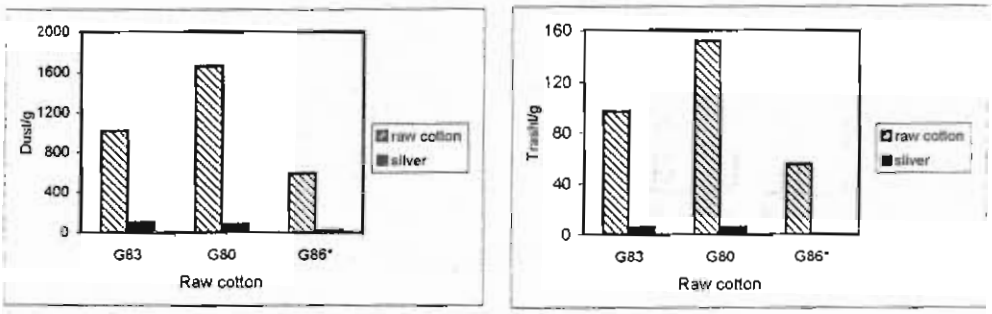


Fig. (3-2) Dust and trash

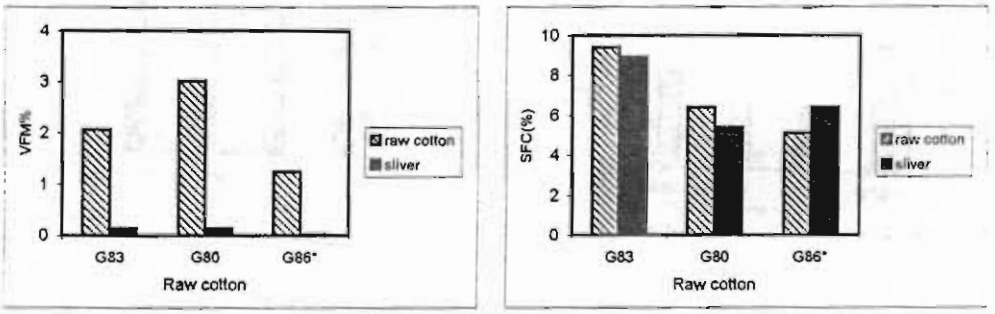


Fig (3-3) Visible foreign matter and short fibre content

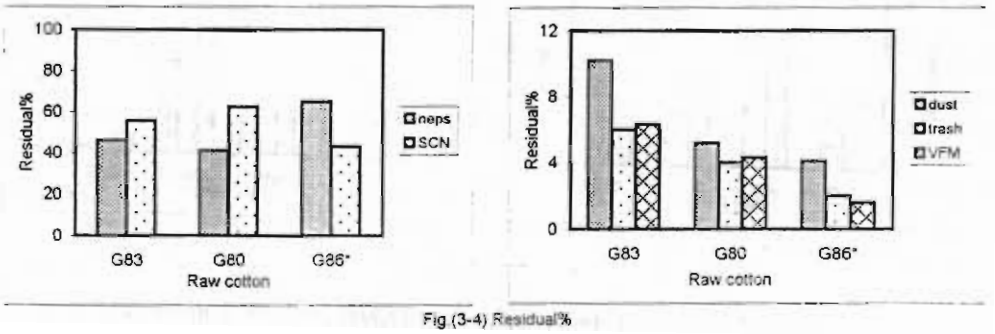


Fig (3-4) Residual%

Fig.(3) Properties of raw cottons and carded slivers processed on line of code (4)

for(G80,101) and the mean value is about 4%, which is lower than that of Syrian cotton (10%) and that concluded by Hebert et al (9), where, they stated that 13% of all neps contained seed coat fragments.

As known opening and cleaning action in blowroom increases nep content in cotton, while carding reduces it. So evaluation will be according to nep residual of carded sliver shown in Table (5). By opening and carding all nep count was decreased are shown in Tables (3) and (4). Minimum residual of neps and SCN (28.6% and zero) was found for the blend (501/502/503) processed by opening and carding number (9). Maximum residual was found for G83 (201) processed in line (6),which was 80.2 and 89% for neps and SCN respectively. Syrian cotton residual neps and SCN is 49.5 and 95% respectively. Mean value of nep residual for Egyptian cottons was 46.35 and 42.8% for neps and seed coat neps respectively

Table (5) Neps and trash residual (%) in carded sliver

Cotton lot and (processing code)	Nep residual (%)	SCN residual (%)	Dust residual (%)	Trash residual (%)	VFM residual (%)
301(7)	30	25	4.2	3	2.5
302/303 (2)	38.3	11.11	2.9	1	0.8
901 (1-A)	41.2	33.33	3	2	1.8
901 (1-B)	34.2	33.33	3.1	2	1.8
901 (1-C)	43	33.33	4.6	3	2.4
901 (3)	55.3	66.7	6.5	7	4.8
901 (5)	39.5	66.7	6	7	4.2
901 (9)	45.6	66.7	7.4	8	6.1
601 (1-A)	35	14.3	3.1	4	2.4
601 (2)	61	28.6	3.1	4	2.4
601 (4)	65	43	4.1	2	1.6
601/602 (2)	43.7	25	13	11	6.5
501(8)	31.1	16.7	4.1	2	1.6
501 (9)	53	50	11.6	7	7
501/502/503 (8)	31	45	4.5	2	1.6
501/502/503 (9)	28.6	0	3.8	2	1.6
201 (4)	46.2	55.6	10.2	6	6.3
201 (5)	51.6	44.44	7.8	6	5.3
201 (6)	80.2	89	7.5	10	9.2
201 (9)	50.1	44.44	6.3	3	5.3
101 (1-B)	46.7	25	3.9	1	1.3
101 (2)	32.7	12.5	1.2	0	0.3
101 (4)	41.1	62.5	5.2	4	4.3
101 (6)	64.5	62.5	4.1	5	4.3
101/102 (6)	75.6	55.6	4.7	5	5.9
101/102 (4)	84.9	66.7	8.4	5	5.8
Mean value	46.35	42.8	5.5	4.5	3.7
Syrian (9)	49.5	95	18.2	14	11.7

3-1-1-Effect of raw material on nep content

Fig.(1-1) and (1-2) show the relationship between nep content in raw cotton and residual in carded sliver. It has been found that, there is a direct correlation between nep content (neps and SCN) in raw cotton and in carded sliver

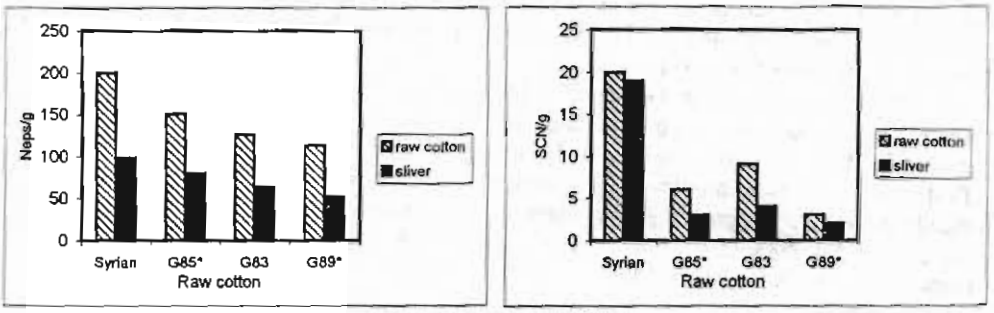


Fig. (4-1) Neps and seed coat neps

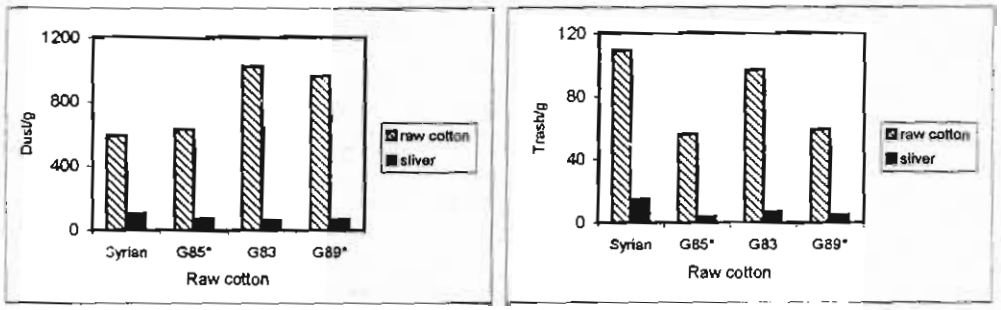


Fig (4-2) Dust and trash

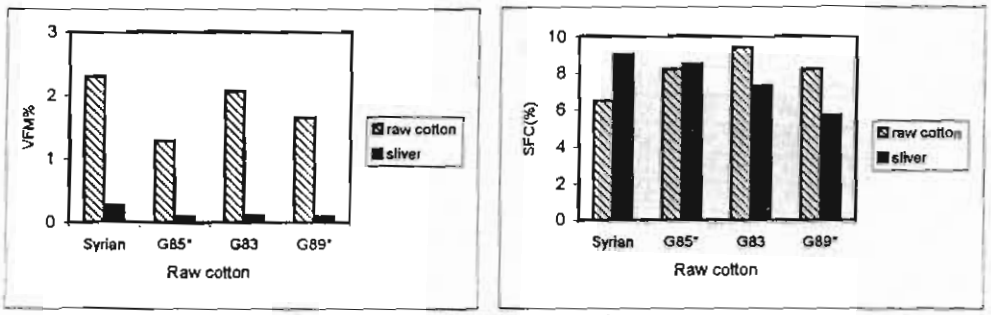


Fig.(4-3) Visible foreign matter and short fibre content

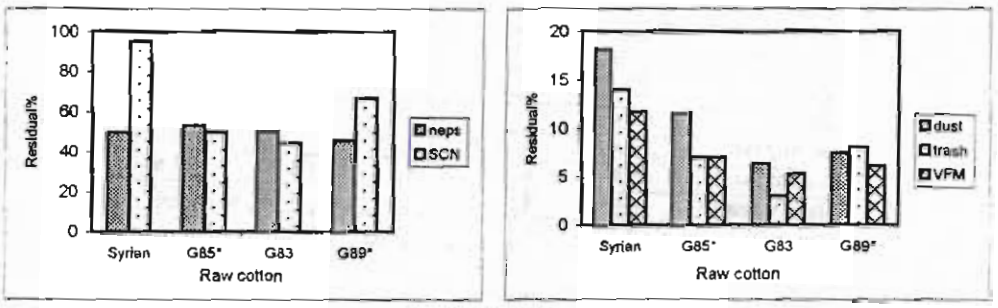


Fig.(4-4) Residual %

Fig.(4) Properties of cottons and carded slivers processed on the line of code (9)

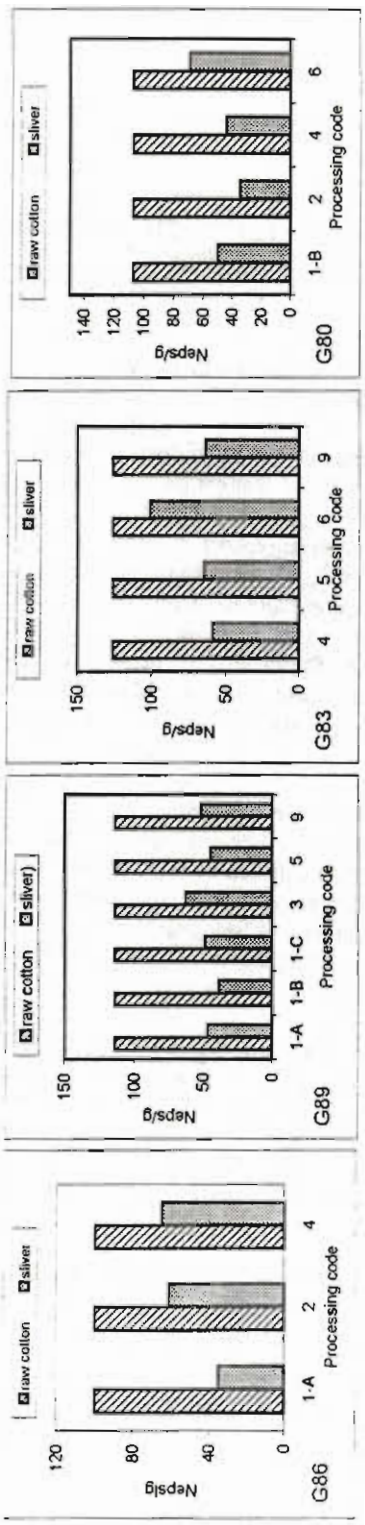


Fig.(5-1) Nep count /g

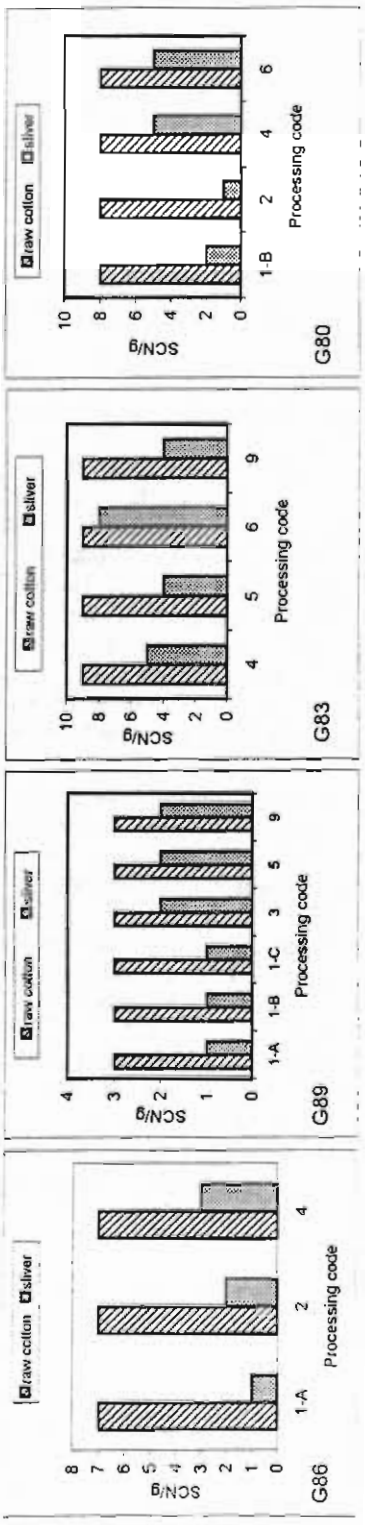


Fig.(5-2) Seed coat neps/g

Fig. (5) Properties of carded slivers processed on different lines

To predict nep and seed coat nep content in Egyptian cottons regression equations were estimated in the following form:

$$Y = C + \Sigma B_i X_i + \Sigma B_j X_i^2$$

Where, Y= nep content in raw cotton, C= constant, Bi and Bj = regression coefficients, Xi = experimental fibre parameters.

-For neps:

$$N = 886.725 + 5.052\,L + 8.07 \times 10^{2} F + 79.968\,I + 27.243\,S - 0.387\,D + 1.276\,T + 216.760\,V + 0.177\,C.V_L^2 + 0.413\,I^2 - 2.242\,S^2 + 1.563 \times 10^{-4} D^2 + 7.27 \times 10^{-3} T^2 - 45.406\,V^2 \quad (r = 1.0)$$

-For seed coat neps

$$SCN = 5.818 - 0.330\,L + 0.203\,F - 2.905\,I - 6.045\,S + 6.72 \times 10^{-4} D + 0.309\,I - 13.446\,V + 2.517 \times 10^{-3} C.V_L^2 + 0.410\,I^2 + 0.395\,S^2 + 2.660 \times 10^{-6} D^2 + 1.28 \times 10^{-3} T^2 + 2.020 V^2 \quad (r = 0.996)$$

Where, N = neps/g, SCN = seed coat neps/g, L = fibre length, $C.V_L$ = coefficient of variation of fibre length, I = immature fibre content, S = short fibre content, D = dust count/g, T = trash count/g, VFM = visible foreign matter %

The correlation coefficient between nep content in Egyptian cottons and fibre parameters is given in Table (6). The results indicate that, a high correlation was found between nep content and both of fibre linear density (mtex) and immature fibre content (IFC). Nep content increases as fibre linear density decreases (r = -0.842) and as IFC increases (r = 0.93). On the other hand no correlation was found between nep content and other cotton parameters in contrary to that stated by Matusiak et.al.(8) . While moderate correlation (0.5-0.6) has been found between seed coat neps content (SCN) and cotton impurities (dust, trash cnt/g and VFM%), no correlation has been found between SCN and other cotton parameters used in investigation.

Fig. (2-1), (3-1) and (4-1) show the effect of raw cotton type on nep and seed coat nep content. It can be noticed that, for cottons (G70, G86, G80) processed on line code (2), maximum nep content for raw cotton, was found for G70, this can be related to the large differences in fibre linear density which is the minimum for G70 i.e. 143 mtex and for other cottons from 165 to 169 mtex. Minimum SCN content was found for G86 (601/602) which has the minimum impurities relative to other cottons as shown in Table (3). Higher reduction in neps and SCN in carded sliver was for G70 . Minimum nep and SCN content in carded sliver was found for G80 and G70 respectively. The same can be noticed in Fig.(2-4), where minimum residual for nep content was for G80 and for SCN content was for G70. For cottons processed on line of code (4), as shown in Fig. (3-1) maximum nep content was for G83 and the minimum was for G86 (raw cotton) and minimum nep residual was for G80 and minimum SCN residual was for G86. Also as shown in Fig. (4-1), For cottons processed on line of code (9), Syrian cotton has the higher nep and SCN count than other Egyptian cottons. The same also was obtained for carded sliver. Minimum residual was found for that produced from G83 as shown in Fig. (4-4).

Table (6) Correlation coefficient between nep content in Egyptian cotton and fibre parameters measured by AFIS system

Fibre parameters	Fineness (mtex)	SFC	IFC	Dust	Trash	VFM	L (mean)	C.V(L)
Neps cnt/g	-0.842	0.23	0.93	0.233	0.135	0.198	0.43	0.056
Seed coat neps cnt/g	0.088	0.347	0.46	0.514	0.624	0.53	-0.144	-0.193

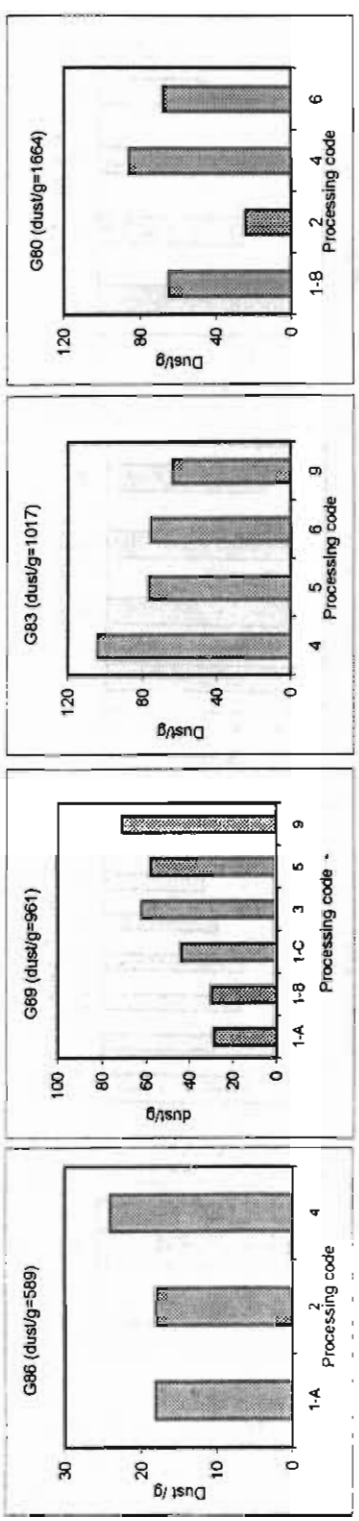


Fig.(5-3) Dust count/g

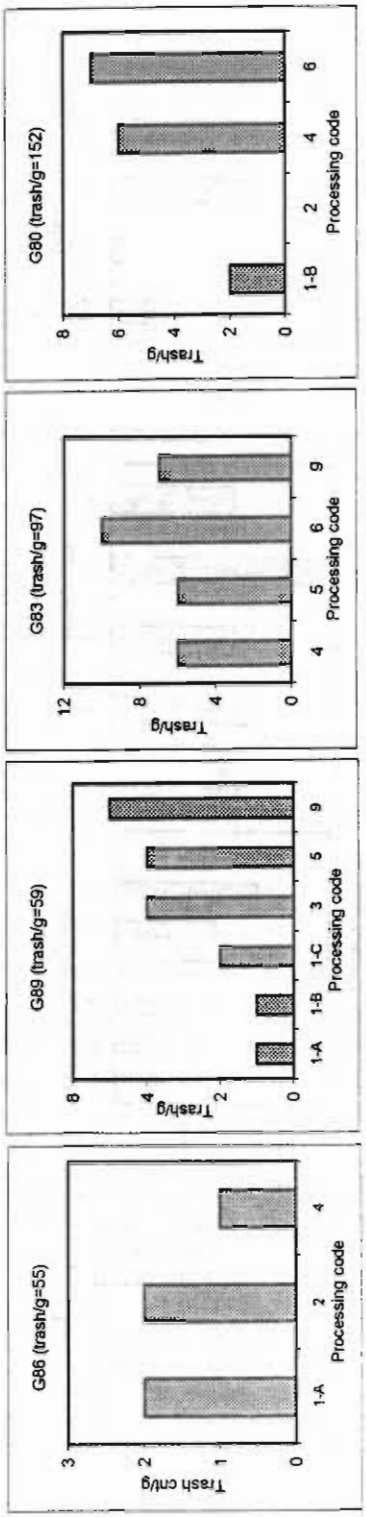


Fig.(5-4) Trash count /g

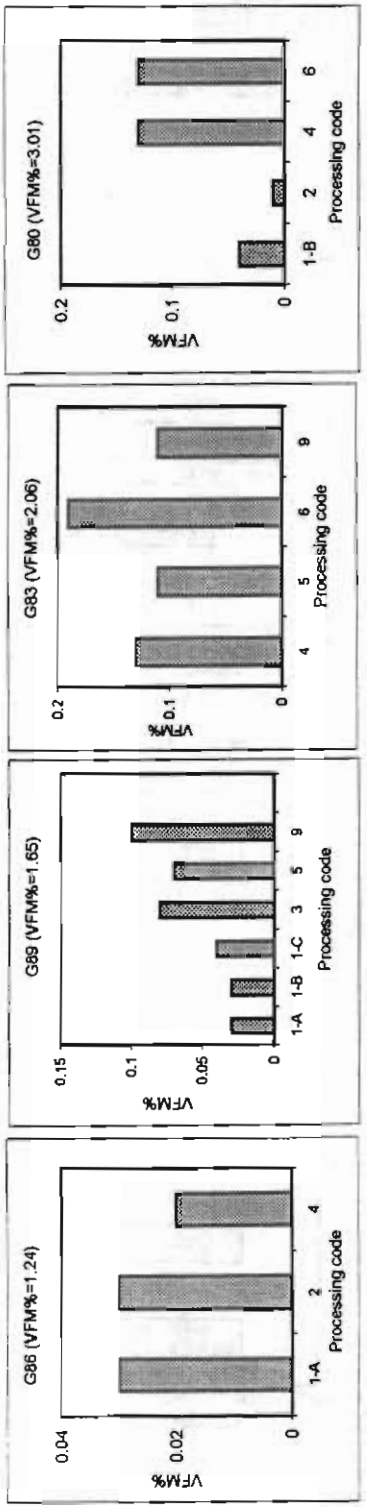


Fig.(5-5) Visible foriegn matter (%)

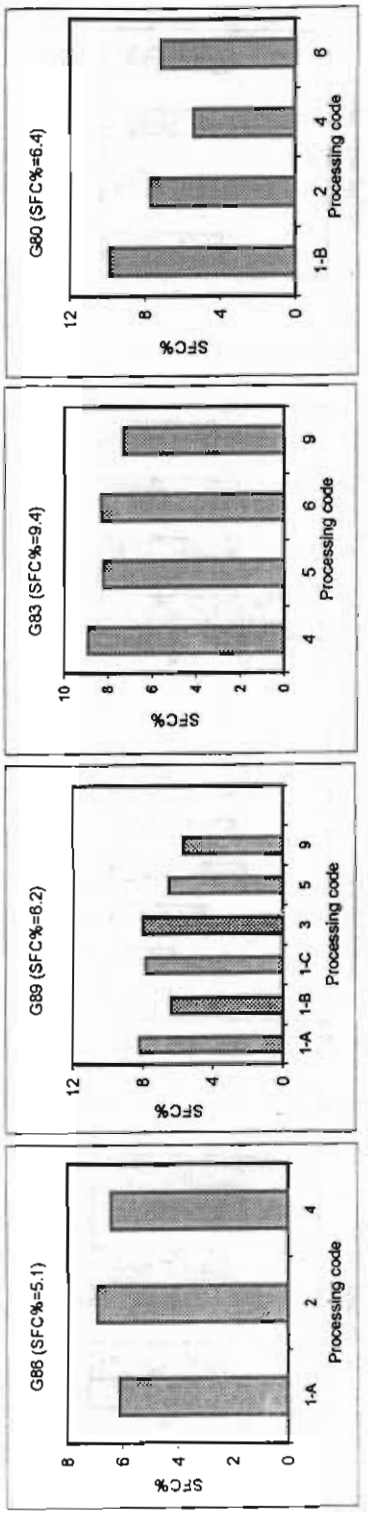


Fig.(5-6) Short fibre content (%)

Fig. (6) shows the evaluation of Egyptian cotton parameters according to Uster Statistics. For nep count, it can be noticed that the majority of cottons (54%) corresponded to 25% of world level, while 38% and 8% corresponded to 5 and 75% respectively. For carded sliver, the majority (81%) corresponded to 50% of world level.

3-1-2-Effect of processing variables on nep content

Effect of processing variables on card sliver properties is shown in Fig. (5). Comparing nep content of carded sliver.

(i) for processing cotton fibre G89 on different lines, as shown in fig. (5-1), the results indicate the that maximum reduction was found for line (1-B). From Table (2) it can be seen that the differences between the three lines were in carding machine elements speed. Where as taker-in and doffer speed gets lower nep removal gets higher. On the other hand, nep removal is higher when processing in line (5) followed by line (9) and the higher for line (3). This may be due to the higher intensity of opening in the case of line (3).

(ii) for 86 (601), as shown in fig. (5-1), minimum nep residual was found for line (1-A) and the maximum was found for line (4)).

(ii) Fig. (5-1) shows the results for G83 (lot 201) , it can be noticed that, minimum nep count occurs with line (4) and maximum nep count (neps and seed coat neps) in carded sliver was found for line of code (6).

(iv) for G80 (101) the same count can be noticed , as shown in Fig. (5-1). As shown in Table (2), line (6) contains 6 cleaning points, higher than other lines by one cleaning point, amongst these is the vertical opener, which generates high stresses in the fibres during processing and increasing nep content.

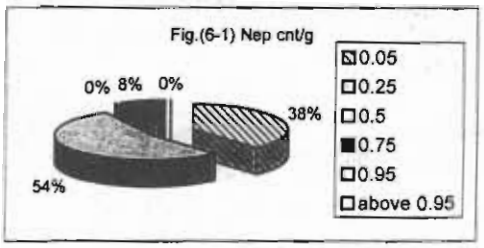
3-2 IMPURITIES

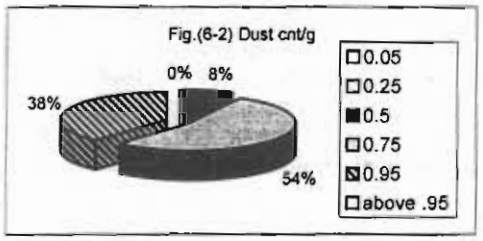
3-2-1-Effect of raw material

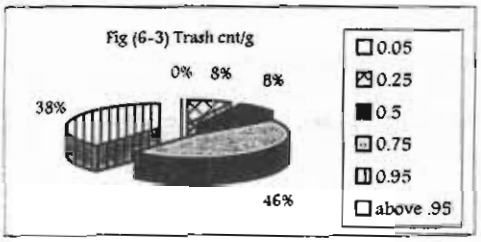
Fig.(1-3), (1-4) and (1-5) show the relation between raw cotton impurities and residual in carded sliver. No correlation has been found between dust, trash count/g and VFM% in raw cotton and residual in carded sliver. Since the evaluation is by counting , where crushing may be take place for trash particles during processing leading to increase its count.

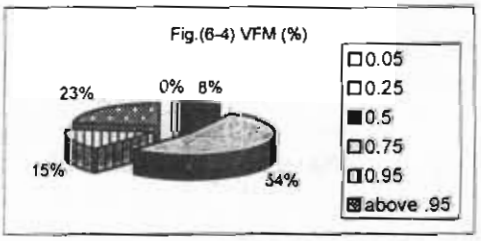
As shown in Fig. ((2-3) and (2-4) and Table (5), for different cottons processed on the line of code (2). Dust, trash count/g and VFM% has the same trend. Higher count was found for G80 followed by G70 and the lower was for G86. Maximum reduction in impurities count was for G80 and G70, although they contain the higher count , but minimum residual was for G80 and maximum was for G86 (601/602). As shown in Fig. (3-2), (3-3) and Table (5), for the cottons processed on the line of code (4), for raw cotton. lower and higher impurities was found for G86 and G80 respectively. For carded sliver, minimum impurities and minimum residual was found for that produced from G86.

Correlation between fibre length parameters (mean fibre length and coefficient of length variation) and each of dust, trash and VFM residual was calculated for cottons processed on the same line. for example, for these processed on line (9), i.e., 901, 501, 510/502/503, and 201. The same was repeated for fibres processed on line (2), (4) and line (6). Results are listed in Table (7) and showed that, there is a correlation between residual of impurities (dust, trash and VFM) and both of mean fibre length and coefficient of length variation.). As mean fibre length increases residual of impurities in card sliver decreases (r is –ve). This means that the removal of impurities during opening and carding increases. Also as coefficient of length variation increases, the residual increases (r is +ve), i.e the removal of impurities during opening and carding decreases.









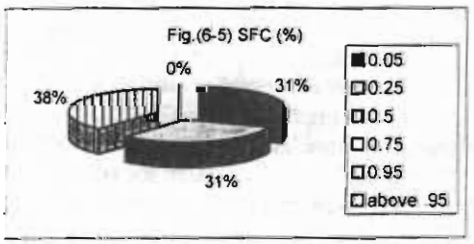
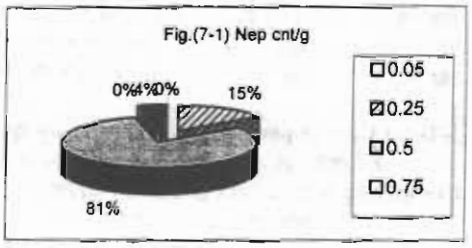
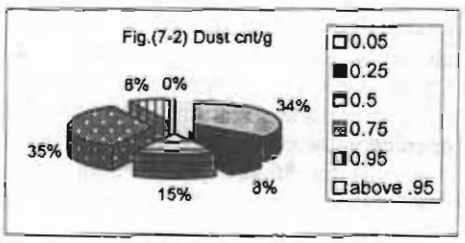
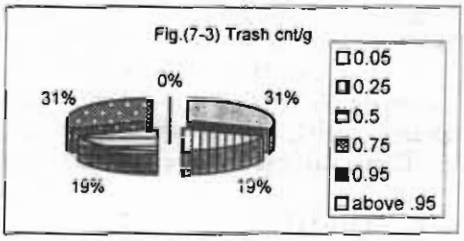
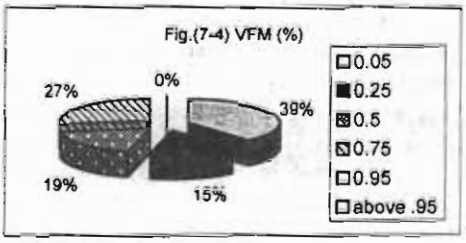


Fig.(6) Evaluation of fibre propertiss in raw cotton according to Uster Statistics









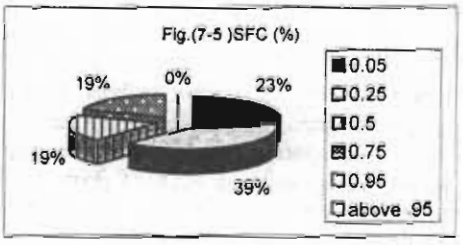


Fig.(7) Evaluation of fibre properties in card sliver a card slive according to Uster Statistics

Table (7) Correlation coefficients between fibre length parameters and impurities residual %age in carded sliver (for Egyptian cottons)

Length paramete	Processing variables code											
	(2)			(4)			(6)			(9)		
	Dust	Trash	VFM	Dust	Trash	VFM	Dust	Trash	VFM	Dust	Trash	VFM
L(mean)	-0.55	-0.58	-0.59	-0.78	-0.71	-0.67	-0.96	-0.99	-0.998	-0.47	-0.05	-0.25
C.V(L)	0.91	0.90	0.89	0.56	0.48	0.48	0.86	0.93	0.95	0.63	0.99	0.91

3-2-2-Effect of processing variables

Fig. (5-3), (5-4) and (5-5) show the impurities of the carded sliver produced from G89 using different processing lines. The lower trash, dust and VFM were found for the line of code (1-A) and (1-B) where the higher was found for line of code (9). For cotton G86 as shown carded sliver produced on the line of code (4) has the minimum trash and VFM residual Also minimum trash residual was found for G83 processed on line (4) and (5). For G80 minimum residual (dust, trash and VFM) was found for this processed on the line of code (2).

According to Uster Statistics, as shown in Fig. (6) and (7), in aspect of dust, trash and visible foreign matter content, majority of Egyptian cottons used in investigation corresponded to 75% of world level. For trash and dust, 38% corresponded to 95% of world level. While for VFM, 23% were above 95% of world level. The majority (39%) of carded slivers, for VFM, corresponded to 5% of world level.

3-3 SHORT AND IMMATURE FIBRE CONTENT

Results of short fibre content (SFC) were listed in Tables (3) and (4) . Minimum and maximum SFC for raw cotton were found for G86 (601) and G83 (201) respectively.

As shown in Fig.(1-6) no correlation was found between SFC in raw cotton and that in carded sliver. Where results in Tables (3) and (4) show that its percent was increased by opening and carding action by about 4 % for Egyptian cotton and by about 39% for Syrian cotton. The same can be noticed in Fig.(2-1), (3-1) and (4-1) for some of the cottons, SFC in carded sliver is higher than that for raw cotton.

According to Fig. (6) and (7) 31% of the cottons corresponded to both 5% and 255% and 38% corresponded to 50% of world level. While for carded sliver 75% of world level was appeared where, 19 % of the slivers corresponded to this level.

For raw cotton immature fibre content (IFC) has the highest value for G70 and the lowest value was for G86. It was 6.19% and 5.7% for Egyptian and Syrian cotton.

4- CONCLUSION

From the experimental work and discussion the following conclusions can be drawn:

1- Empirical formulas were calculated to predict nep and seed coat nep content in raw cotton

- According to Uster Statistics in aspect of neps 38, 54, and 8% of Egyptian cottons corresponded to 5, 25 and 75% of world level. So Egyptian cottons are characterized by low nep content, for both neps and seed coat neps, while Syrian cotton is characterized by high nep content.
- Nep content was highly correlated to fibre linear density (r is –ve) and immature fibre content (r is +ve)
- Seed coat nep content was directly correlated to cotton impurities

- Also percentage of seed coat nep content to total nep content is about 4%, for Egyptian cottons, and 10% for Syrian cotton on the other hand.
- For Egyptian cotton, card sliver nep residual is 46.35 and 42.8% for neps and seed coat neps respectively. For Syrian cotton it is 49.5 and 95% respectively.

2- Egyptian cottons were characterized by high trash content. Since the majority of cottons were corresponded to level 75 and 95% according to Uster Statistics.
- By opening and carding, of Egyptian cottons, a large percentage of trash was extracted. Since the residual was 5.5, 4.5 and 3.7% of dust, trash and visible foreign matter respectively. Which is 18.2. 14. And 11.7% for Syrian cotton respectively.

3- In aspect of short fibre content (SFC) majority of Egyptian cottons corresponded to 5 and 25% of world level according to Uster Statistics
- Results showed that, for Egyptian cottons, SFC in card sliver is higher than that in raw cotton by about 4%, where for Syrian cotton it was higher by about 39%.
- For Egyptian cottons, no correlation has been found between trash residual in carded sliver and raw cotton impurities. While an inversely correlation and a direct correlation between trash residual in carded sliver and both of mean fibre length and length coefficient of variation ($C.V_L$) respectively. So $C.V_L$ it is very important factor during purchasing of raw materials and during blend composing.

REFERENCES

1-B.Xu, C.Fang and M.D.Waston, T.R.J. 69, 656, 1999.
2-W.S.Anthony, W.R.Meredith, J.R.Williford and G. J. Mangialardi, T.R.J. 58, 111, 1988.
3-W.Klein and U.Schneider, ITB, 17, 2/1992.
4-Q.Robert, J.B.Price and X.Cui, T.R.J, 70, 108, 2000.
5- Q.Robert, J.B.Price and X.Cui, T.R.J. 67, 417, 1997
6-W.S.Anthony, W.R.Meredith and J.R.Wiliford, T.R.J. 58, 633, 1988.
7-J.J.Hebert, G.J.Mangialardi and H.H.Ramey, T.R.J. 56, 108, 1986.
8-M.Matusiat and I.Frydrych, Mansoura Third International Eng. Conference, 443, April 2000.
9- J.J.Hebert, E.K.Boylston and D.P.Thibodeaux, T.R.J. 58, 380, 1988
10-G.J.Mangialardi, T.R.J. 62, 335, 1992
11-W.Zurek, M.Greszta, I.Frydrych and G.Bolcar, T.R.J. 69, 804, 1999.
12-G.H.Danidonis, A.Johnson, J.A.Landivar and K.B.Hood, T.R.J.69, 754, 1999.
13-C.K.Bragg and F.M.Shofner, T.R.J. 63, 171, 1993.
14-J.M.Bradow, O.N.Hinojosa, L.H.Wartelle, G.Davidonis, G.F.S.Cole and P.Bover, T.R.J 66, 545, 1996.
15-R.S.Krawicki, O.Hinojosa, D.P.Thibodeaux and K.E.Duckett, T.R.J.66, 70,1996.