Effect of Some Construction Factors on Fabrics Used in Traveling Bags

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Abstract: Fabrics are often utilized in the construction of various types of bags, specially traveling bags, where strength, flexibility and durability are important. The aim of this research is to produce woven fabrics suitable for being used in traveling bags. All samples under study were produced of polyester yarns 50, 70 and 100 denier .Three weft sets were used 60, 80 and 100 picks /cm and three fabric structure (plain weave 1/1, twill 1/4 and satin 5). Samples were coated using P.V.C in order to produce a waterproof, moisture vapor permeable laminated fabrics and having perforation to provide ventilation to the user. The influence of previous parameters on the performance of the end-use fabric was studied. On the other hand physico-chemical properties including, tensile strength and elongation, abrasion resistance, water permeability, water repellency, tear resistance, thickness and weight were evaluated according to the final product needs. Some more results were reached concerning structures and materials. Most samples have achieved the expected results.

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1. Introduction

The industrial fabric segment of the textile field has grown more rapidly than the apparel and house hold textile areas approximately 10 percent a year, and makes up about 20 percent of the market share of textile products. [(1)] The" industrial textiles" is usually associated with special woven fabrics or flat textiles produced by other fabric forming techniques, provided with sophisticated finishes and made up for heavy duty services.[(2)] Many forms of luggage bags designs have been developed over the years , each new design in most cases being oriented to fulfill a special need for the user [.(3)] Bags , specially traveling bags, have seen spectacular development since the time of jute, wool, and leather bags[.(2).] Most utility bags these days are made of fabric, as most fabrics are reasonably light in weight, strong and durable. The flexibility of most fabrics permits bags to be conveniently stored when not in use and facilitates handling them when in use. [(4)]

Bags:

A bag is defined as a simple tool in the form of a non-rigid container. The use of bags predates recorded history with the earliest bags being no more than lengths of animal skin or woven plant fibers, folded up at the edges and secured in that shape with strings of the same material.

Despite their simplicity, bags have been fundamental for the development of human civilization ,as they allow people to easily collect loose materials such as berries or food grains ,and to transport more items that could not readily carried in the hands[.(5)]

In the past, people usually regard bags as major accessories to clothes. In recent years, due to the trend of emphasizing on sports activities, traveling as well as vacation, bag design gradually attracts people's attentions. Especially, sports bags, leisure bags and traveling bags start to take centre part of the bag design stage. Leather was the conventional material used in bags. However, the supply of leather material is decreasing now, so the cost of material is rising. Therefore, synthetic leather as well as fabrics, either natural or synthetic ones such as cotton, flax silk, nylon and synthetic silk, are more and more adopted by bag industries[.(6)] The popularity of synthetic fibres can be attributed to the fact that they are generally stronger and more durable than their natural fibre counterparts[.(7)]

Types of bags:

The demand for bags has been steadily growing and to meet marked demand, manufacturers produce the bag in a wide range of sizes, diameters, heights, colours and capacities. [(2)]

Fabric bags are of a wide variety of types according to their multitude purposes. For example, various types of back-packs are used by campers and hikers. Duffel bags in a wide range of sizes are available for such purposes as carrying athletic equipments and also larger duffel bags are used for extended travel, particularly recreational travel. Bicycle and motorcycle enthusiastic have long used seat bags, handle bar bags and saddlebags. Mothers of infant children are well acquainted with various types of diaper bags. Women carry an often incredible variety of objects in hand bags and shoulder bags. Students in schools use a wide variety of utility bags to carry books and other materials. [4]

Textile transport bags are different kind of fabric bags as they serve to transport loose materials in load weights of 1 ton or more. They are made of a strong textile fabric containing nylon or polyester filament yarns with a double sided PVC coating. [2]

Bags can also be classified into reusable bags and disposable bags but even disposable bags can often be used many times for economic and environmental reasons. On the other hand, there may be logistic or hygienic reasons to use a bag only once. [5]

Traveling bags

Over the years, travel kits and other kind of travel bags for carrying the traveller items and cloth have proven to be popular.[8] Soft-sided hand luggage bag such as rolling travel bags and the like generally include a rigid frame forming a hard side wall boundary for a transportable clothing compartment with a flexible fabric enclosure attached to the rigid frame. Such travel bags are usually equipped with wheels and a retractable pull handle.

Fabrics play a distinguished role in these kinds of travel bags as they exhibit strength and durability without sacrificing storage volume or increasing the net weight of the bag. [9] Bags of this type are intended to be placed on flat, horizontal surface when used, to provide stability. [8]

Construction of fabric bags

Textile bags can be classified according to their construction into two main types:

1- Woven fabric bags

This kind of bags is produced using woven fabrics of natural fibers such as cotton, flax, and jute with high numbers of warp and weft sets in order to obtain the required tenacity.

2- Coated fabric bags

This kind of bags is usually produced of synthetic yarns (such as polyester, nylon, polypropylene yarns and coated from one or both sides with a suitable natural, man-made or rubber elastomer material to increase its endues tenacity. This type of bags has successfully replaced the other type of bags that made of natural fibers. [2]

Properties of travel bags

Woven fabric bags designed for heavy duty outdoor applications , such as traveling bags, have to meet stringent quality requirements because , in particular use , they are directly exposed to many hazards and must be resistant enough to withstand the various adverse effects involved. This means that travelling bags must exhibit the following properties:

1- High tensile strength
2- Adequate elongation
3- High tear resistance
4- High abrasion resistance
5- Low weight
6- Water proofness
7- High dimensional stability

Beside the previous properties, traveling bags must exhibit adequate service life and reasonable price, [2] and they must also be seamed with adequate strength to withstand filling , transportation and handling. [10]

Coated fabrics

A coated fabric is a composite textile material where the strength characteristics and other properties are improved by applying a suitable formulated polymer composition. The selection of fiber and fabric for coating depends on the type of coating and end-use performance requirements. The performance standards are usually set up based on biaxial strength both tensile and tear, abrasion resistance, stiffness, dimensional stability, thermal stability, chemical resistance, water repellency and air permeability requirements. To meet these requirements proper choice of fiber, fabric construction and the polymeric coating compounds are needed.

Coated fabrics are used in many industrial applications including architecture and construction, transportation, safety and protective systems.etc. [11]

2. Experimental work

This research concerns with producing fabrics suitable as traveling bags. All samples in the research were produced with woven technique. all samples in the research were produced with polyester yarns using three woven structure (Plain weave 1/1, twill 1/4 and satin 5) three weft sets were also used (60,80 and 100 picks),sing three different yarns count (50,70 and 100 yarns).

Finishing treatment

The produced fabrics were undergoing special treatments before being used, Samples were treated using solution containing 250 ml P.V.C + 250 ml oxide titanium + 500 ml Dioxins-polychlorinated dibenzo dioxins Solvent and then mixed together to harmony in a mixer . The fabric samples were dried at 100 ^{0}C for 3 min, then thermo-fixed at 170 ^{0}C for 1 min. All samples were treated with P.V.C to make the fabric repellent and a barrier to rain and water proof

Tests applied to samples under study

Several tests were carried out in order to evaluate the performance of samples under study, these were:-

1-**Fabric thickness**, this test was carried out according to the (ASTM-D1777-96) [12]

2-**Fabric weight**, this test was carried out according to the (ASTM-D 3776- 79) [13]

3-**Water repellency**, this test was carried out according to the (AATCC392-63) [14]

4-**The abrasion resistance**, this test was carried out according to the (ASTM-D1175) [15]

5-**Tear resistance**, this test was carried out according to the (ASTM-D 1424) [16]

6-**The tensile strength and elongation at break**, this test was carried out according to the (ASTM-D1682) [17]

3. Results and Discussion

Thickness

It is clear from the diagrams (1and 2) that, plain weave structure has recorded the highest rates of thickness, followed by twill weave, and then satin weave which achieved the lowest rates, but the differences between them were insignificant. This is mainly due to the nature of plain weave structure which has more ridges on fabric surface giving it the ability of being thicker than the other structures.

It is obvious from the results that yarn count, has strong effect on samples thickness as 100 denier have recorded the highest thickness followed by samples with 70 denier and then 50 denier. This is due to that yarns of 100 denier are thicker than yarns of 70 and 50 denier, causing the produced samples to be thicker.

It was also found that the more yarns per unit area the more thicker the samples become, so samples with 100 picks per cm have recorded the highest rates of thickness, whereas samples with 60 picks per cm have recorded the lowest rates . This is due to that the increase in number of picks/cm causes the produced fabric to be more compacted and then the thickness will be increased.

From the statistical analysis of the results, it was found that treating samples with P.V.C has caused fabrics to gain more thickness compared to non treated samples as treatment causes an increase in fabrics weight and hence in thickness.

Weight

We can notice from figure (3) that structures of samples under study had insignificant effect on samples weight but samples of plain weave had more thickness than the other two weave structures.

It is also clear that samples produced of 100 denier have recorded the highest weight followed by samples with 70 denier, and then samples with 50 denier; this is for sake of that yarns of 100 denier are thicker than yarns of 70 and 50 denier, causing the produced samples to be increased in weight.

It is clear from the results and figures (3 and 4) that, there is a direct relationship between number of picks per unit area and samples weight as samples with 100 picks per cm have recorded the highest weight, whereas samples with 60 picks per cm have recorded the lowest weight. This is due to that the increase of number of picks/cm causes the produced fabric to be more compacted because of the decrease in spaces between yarns leading to the increase in fabric weight.

It is also obvious from the statistical analysis of weight test that treated samples had more weight compared to non treated samples. This is due to that when treatment solution gets between yarns it closes the spaces between them leading to add more weight to the fabrics.

Water repellency

From table (2) and figure (7) we can notice that plain weave structure has scored the highest rates of water repellency compared to other structures but the differences were insignificant as all samples were completely impermeable to the passage of water (waterproof) because of the effect of coating material.

It is also clear from the results that samples produced of 100 denier have recorded the highest rates of water repellency followed by samples with 70 denier, and then samples with 50 denier, where it could be reported that yarns of 100 denier are thicker than yarns of 70 and 50 denier, causing the produced samples to be more compacted because of the decrease in spaces between yarns and so its permeability to water will decrease leading to the increase in samples water repellency and this effect was increased after treating samples with P.V.C.

It was also found that, there is a direct relationship between weft set and water repellency, where it could be reported that the increase in weft set caused a decrease in fabrics openings and so increase fabrics compactness so its permeability to water will decrease leading to the increase in samples water repellency and this effect was increased after treating samples with P.V.C.

From results obtained after treatment it was found that all treated samples have achieved 100 % water repellency, this is due to that treatment caused a decrease in fabrics pores (blocking of the surface) and so the fabrics resistance to the passage of water through it will be increased , and thus increase its water repellency.

Abrasion resistance

It is obvious from the table (2) that plain weave structure has recorded the highest rates of abrasion resistance (lost weight and thickness ratio), followed by twill structure whereas satin has recorded the lowest rates, but after treating samples with P.V.C these differences were insignificant. This is mainly due to the nature of plain weave structure which has regular surface and less floats compared to twill and satin structures which have long floats on their surface facing the abradant of the abrasion resistance tester so they can be abraded easily compared to plain weave structure.

It is also clear from the results, that there is a direct relationship between number of picks per cm and abrasion resistance (lost weight and thickness ratio). This is for sake of that the increased number of picks, which cause fabrics to be more compacted leading to an increase in its resistant to be abraded compared to samples of less number of picks/cm which will be more loosely and easily abraded, but after treating samples with P.V.C these differences were insignificant

We can also notice that samples made of 50 denier yarns have obtained the lowest rates of abrasion resistance whereas samples made of 100 denier have obtained the highest rates. This is probably due to that the more diameter the yarns get the more compacted the fabric become and this is for sake of the increasing of the cover factor leading to the increase of samples resistance to be abraded, but after treating samples with P.V.C these differences were insignificant.

It is also obvious from the results that treated samples did not give any readings on the test apparatus which means that their abrasion resistance was increased and it was larger than the capacity of the abrasion resistance tester, as samples were exposed to 30000 rounds.

Tear resistance

It is also obvious from the table (14) and figures (12 and 13) that plain weave has recorded the highest rates of tear resistance followed by twill 1/4 and then satin has recorded the lowest rates. This is mainly due to that plain weave structure has more intersections per unit area so the ability of yarns slippage will be decreased leading to the increase in samples tear resistance compared to other structures which have less intersections per unit area.

From the results in table (14) it can be seen that, with the increase of weft set, the tear resistance increases. This is mainly because of that the increase of weft set means that contact areas between yarns will be increased and its resistance to slippage will also be increased leading to the increase in fabric tear resistance.

It is obvious from the tearing resistance results and figure (8) that samples with 50 denier have recorded the lowest rates of tear resistance followed by samples with 70 denier and then 100 denier .This is mainly due to that yarns of 100 denier are thicker than yarns of 50 and 70 denier and so spaces between yarns will be decreased leading to the increase in friction areas between them and their resistance to slippage will also be increased causing the produced samples to be higher in their tear resistance.

It is also clear from figures that treated samples had a highest tear resistance compared to untreated samples. This is mainly due to that treatment caused a decrease in fabrics pores and so the fabrics become more compacted, and thus increase fabric tear resistance.

Tensile strength and elongation

It is obvious from the table (14) that plain weave structure has recorded the highest rates structure of tensile strength and the lowest rates of elongation, whereas satin structure has recorded the lowest rates of tensile strength and the highest rates of elongation. This is mainly due to that plain weave structure has more intersection points per unit area so the ability of yarns slippage will be decreased leading to the increase in samples tensile strength and decreasing its elongation compared to twill and satin structures which have less intersections per unit area.

It is clear from figures (15,16,17 and 18) that there is a direct relationship between number of picks /cm and fabrics tensile strength and also an inverse relationship between number of picks /cm and elongation properties as samples with100 picks /cm have recorded the highest rates of tensile strength and the lowest rates of elongation at break, whereas samples with 60 picks/cm have recorded the lowest rates of tensile strength and the highest rates of elongation. This is because the increase in number of yarns per unit area leads to the increase in friction areas between yarns and so the ability of yarns slippage will be decreased leading to the increase in samples tensile strength and the decrease in its elongation compared to samples with less number of yarns per unit area.

It is obvious from the tensile strength and elongation results that samples with 100 denier have recorded the highest rates of tensile strength, and the lowest rates of elongation, followed by samples with 70 denier and then 50 denier .This is due to that yarns of 100 denier are thicker than yarns of 50 and 70 denier and so spaces between yarns will be decreased leading to the increase in friction areas between them causing the produced samples to be higher in their tensile strength and have lower elongation ratio.

It is also obvious from the results that treated samples have achieved higher tensile strength and lower elongation compared to untreated samples. It can be reported that when treatment solution penetrates between yarns it decreases the freedom of yarns movement and so the contact areas between yarns will be increased and its resistance to slippage will also be decreased, leading to the increase in fabrics tensile strength and the decrease in its elongation.

Table (1): Specifications of samples under study

No.	Property	Specification
1	Warp type	Polyester
2	Weft type	Polyester
3	Count of warp yarns	70 denier
4	Count of weft yarns	50,70 and 100 denier
5	Warp set (ends / cm)	100 ends/cm
6	Weft set (picks / cm)	60,80 and 100 picks / cm
7	Fabric structure	Plain weave 1/1, twill 1/4 and satin 5
8	Reed used	10 dents /cm
9	Denting	10 ends /dent
10	Finishing	All samples were treated with P.V.C.

Table (2): Results of thickness, weight and water repellency tests applied to samples under study

Sample No.	Yarn count (denier)	Fabric structure	Tests applied to samples under study						
			Thickness (mm)		Weight (g/m^2)		Water repellency (%))	Abrasion resistance	
			Before treatment	After treatment	Before treatment	After treatment	Before treatment	(Lost of thickness (%))	(Lost of weight (%)
1	50	Plain weave 1/1	0.49	0.59	167	247	55	0.55	3.15
2			0.50	0.63	197	275	60	0.50	2.87
3			0.52	0.67	207	299	65	0.46	2.43
4		Twill 1/4	0.47	0.57	168	249	65	0.57	3.61
5			0.49	0.61	194	282	70	0.54	3.21
6			0.52	0.66	205	296	75	0.51	2.92
7		Satin 5	0.46	0.58	165	239	70	0.59	3.99
8			0.48	0.61	181	261	80	0.56	3.64
9			0.50	0.64	192	279	85	0.53	3.32
10	70	Plain weave 1/1	0.55	0.64	202	292	60	0.49	2.72
11			0.58	0.67	227	317	65	0.44	2.41
12			0.59	0.70	243	345	70	0.39	2.07
13		Twill 1/4	0.54	0.68	200	289	75	0.53	3.11
14			0.58	0.70	210	296	80	0.49	2.67
15			0.61	0.72	222	319	85	0.43	2.41
16		Satin 5	0.53	0.70	205	296	75	0.56	3.52
17			0.55	0.73	237	338	85	0.52	3.02
18			0.57	0.75	257	364	90	0.48	2.72
19	100	Plain weave 1/1	0.59	0.74	278	391	70	0.38	2.29
20			0.62	0.75	223	449	75	0.33	2.03
21			0.64	0.79	339	471	85	0.29	1.73
22		Twill 1/4	0.58	0.74	279	392	80	0.42	2.53
23			0.63	0.76	313	436	85	0.37	2.27
24			0.65	0.80	331	474	90	0.32	1.94
25		Satin 5	0.57	0.72	281	391	80	0.46	2.71
26			0.60	0.74	312	438	90	0.41	2.48
27			0.63	0.78	327	454	95	0.39	2.19

Table (3): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on thickness, at 50 denier before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 00075X + 0.443333	0.98981
Twill 1/4	Y = 0.001X + 0.41	1
Satin 5	Y =0.001X + 0.4	1

Table (4): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on thickness, at 100 denier after treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 00125X + 0.60	0.999911
Twill 1/4	Y = 0.0015X + 0.746667	0.98981
Satin 5	Y =0.0015X + 0.626667	1

Table (5): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on weight, at 70 denier before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 025X + 142	0.992065
Twill 1/4	Y = 0.55X + 166. 6667	0.998625
Satin 5	Y =1.3X + 129	0.991241

Table (6): Regression equation and correlation coefficient for the effect of number of picks /cm and yarn count on weight, at twill 1/4 before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 425X + 115	0.973689
Twill 1/4	Y = 0.56X + 166. 6667	0.998625
Satin 5	Y =1.3X + 203.6667	0.984585

Table (7): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on water repellency, at plain weave 1/1 before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 25X + 40	1
Twill 1/4	Y = 0.25X + 45	1
Satin 5	Y =0.375X + 64.6667	0.98981

Table (8): Regression equation and correlation coefficient for the effect of number of picks /cm and yarn count on water repellency, at twill 1/4 before treatment.

Yarn count	Regression equation	Correlation coefficient
50	Y =0. 25X + 50	1
70	Y = 0.25X + 60	1
100	Y =0.25X + 65	1

Table (9): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on water repellency, at 70 denier before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 25X + 45	1
Twill 1/4	Y = 0.25X + 60	1
Satin 5	Y =0.375X + 35.3333	0.98981

Table (10): Regression equation and correlation coefficient for the effect of number of picks /cm and yarn count on abrasion resistance, at plain weave 1/1 before treatment.

Yarn count	Regression equation	Correlation coefficient
50	Y =0.00225X + 0.683333	-0.997949
70	Y =- 0.0025X + 0.64	-1
100	Y =0.00225X + 0.51333	-0.997949

Table (11): Regression equation and correlation coefficient for the effect of number of picks /cm and yarn count on abrasion resistance, at satin 5 before treatment.

Yarn count	Regression equation	Correlation coefficient
50	Y =0.0015X + 0.68	-1
70	Y =- 0.002X + 0.68	-1
100	Y =0.00175X + 0.56	-0.970725

Table (12): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on abrasion resistance, at denier 50 before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0.001675X + 4.99	-0.999666
Twill 1/4	Y =- 0.01725X + 4.626667	-0.995791
Satin 5	Y =0.018X + 4.256667	-0.99187

Table (13): Regression equation and correlation coefficient for the effect of number of picks /cm and yarn count on abrasion resistance, at twill 1/4 before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0.01725X + 4.62667	-0.995791
Twill 1/4	Y =- 0.175X + 4.13	-0.989158
Satin 5	Y =0.01475X + 3.426667	-0.997662

Table (14): Results of the tests ,thickness , weight and water repellency applied to the samples produced under study

Sample No.	Yarn count (denier)	Fabric structure	The tests					
			Tear resistance (Kg)		Tensile strength (Kg)		Elongation (%)	
			Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
1	50	Plain weave 1/1	1780	5800	123	211	61	46
2			2300	7300	149	264	59	45
3			2780	8300	174	312	58	43
4		Twill 1/4	1650	4240	117	202	62	49
5			1960	5650	141	249	60	46
6			2450	7200	164	294	59	45
7		Satin 5	1400	2890	108	187	64	50
8			1730	3900	132	230	61	48
9			2130	5400	151	264	60	47
10	70	Plain weave 1/1	2890	8650	150	265	55	40
11			3200	9800	165	298	52	38
12			3500	10500	199	363	49	35
13		Twill 1/4	2400	6900	145	254	57	43
14			2700	8730	161	284	54	40
15			3100	9700	187	332	51	47
16		Satin 5	2200	5800	139	242	59	49
17			2300	6760	154	271	57	46
18			2600	7500	180	321	53	44
19	100	Plain weave 1/1	3200	9250	220	381	47	31
20			3800	10750	249	452	45	29
21			4000	12800	305	496	42	26
22		Twill 1/4	2800	8460	203	361	49	35
23			2650	9800	234	411	46	31
24			3300	11600	291	472	44	26
25		Satin 5	2300	7620	185	329	52	36
26			2480	9100	227	397	50	34
27			2890	10400	278	454	47	32

Table (15): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on tear resistance before treatment, at 50 denier yarns.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =0. 25X + 266.6667	0.999733
Twill 1/4	Y = 20X + 420	0.991688
Satin 5	Y =18.25 X + 293.333	0.998471

Table (16): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on tear resistance, at 70 denier yarns.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =70X + 2893.333	0.990282
Twill 1/4	Y = 70X + 2893.333	0.984639
Satin 5	Y =42.5X + 3288.667	0.99722

Table (17): Regression equation and correlation coefficient for the effect of number of picks /cm after and before treatment ,on tear resistance, at 100 denier and twill weave 1/4.

Variables	Regression equation	Correlation coefficient
Before treatment	Y =12.5X + 1916.667	0.834553
After treatment	Y = 78.5X + 3673.333	0.996442

Table (18): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on tensile strength, 50 denier yarns before treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =1.275X + 46.66667	0.999936
Twill 1/4	Y = 1.175X + 46.66667	0.999925
Satin 5	Y =1.075X + 44.3333	0.997754

Table (19): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on tensile strength, at 70 denier yarns after treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =1.975X + 120	0.988927
Twill 1/4	Y = 1.95X + 134	0.991241
Satin 5	Y =1.075X + 112.6667	0.98269

Table (20): Regression equation and correlation coefficient for the effect of number of picks /cm and yarn count on tensile strength, satin 5 before treatment.

Yarn count	Regression equation	Correlation coefficient
50	Y =1.075X + 44.3333	0.9997754
70	Y = 1.025X + 75.66667	0.988215
100	Y =2.325X + 44	0.998443

Table (21): Regression equation and correlation coefficient for the effect of number of picks /cm and fabric structure on elongation, at 50 denier yarns after treatment.

Fabric structure	Regression equation	Correlation coefficient
Plain weave 1/1	Y =-.0075X + 50.66667	-0.981981
Twill 1/4	Y =- 0.1X + 54.66667	-0.960769
Satin 5	Y =0.075X + 54.3333	0.981981

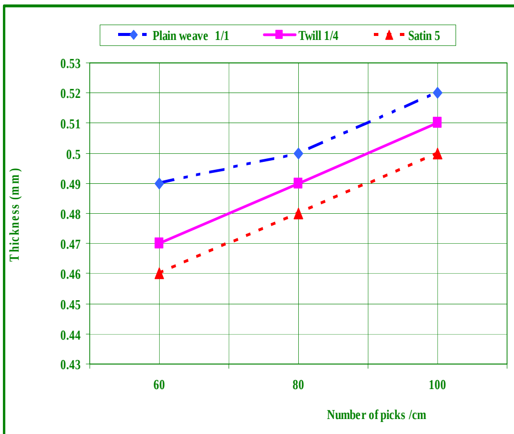

Fig.(1) effect of fabric structure and weft set on thickness before treatment ,using polyester 50 denier .

Fig.(2) effect of fabric structure and weft set on thickness after treatment ,using polyester 100 denier .

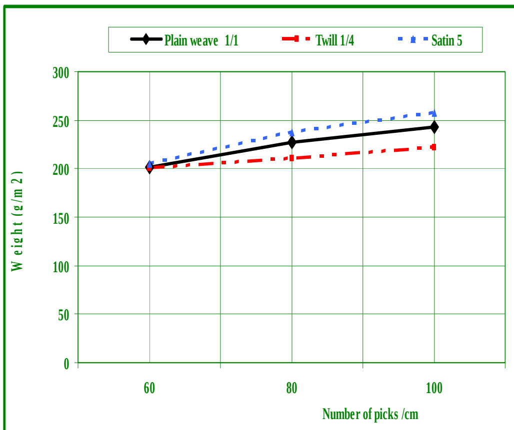

Fig.(3) effect of fabric structure and weft set onweight before treatment ,using polyester 70 denier .

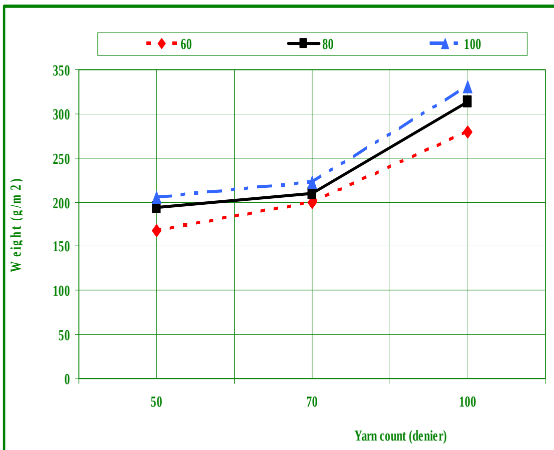

Fig.(4) effect of yarn count and weft set onweight before treatment ,using twill 1/4 .

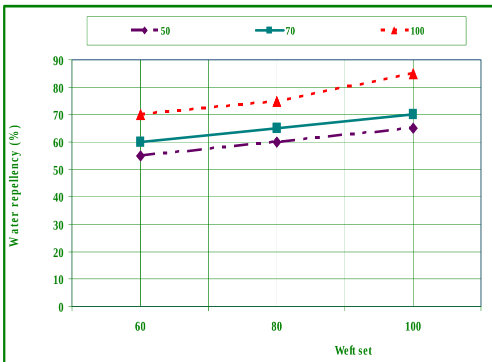

Fig.(5) effect of yarn count and weft set on water repellency before treatment ,using plain weave 1/1.

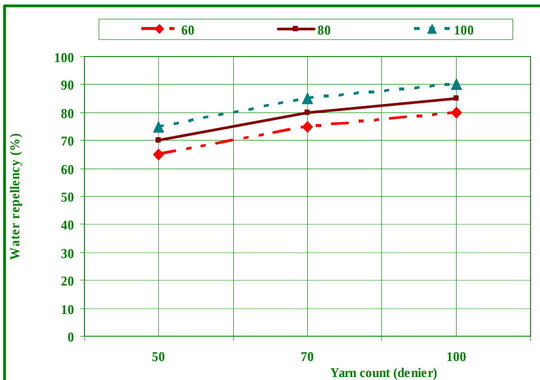

Fig.(6) effect of yarn count and weft set on water repellency before treatment ,using twill 1/4.

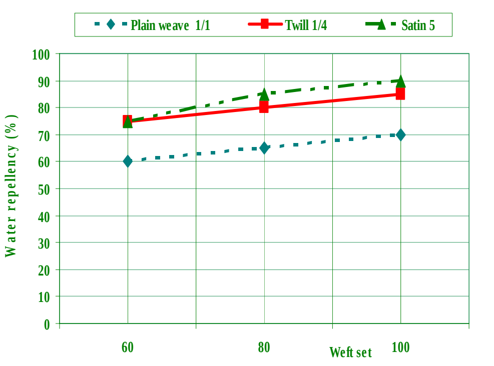

Fig.(7) effect of fabric structure and weft set on water repellency before treatment ,using 70 denier.

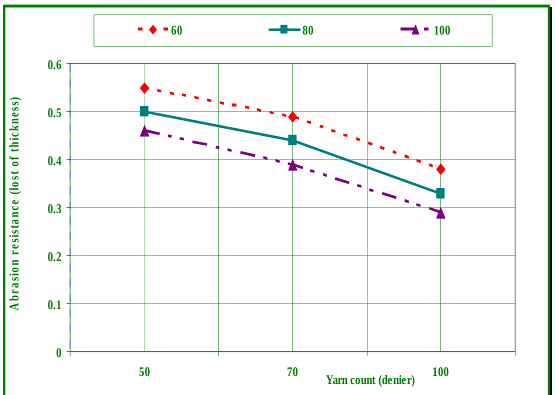

Fig.(8) effect of yarn count and weft set on abrasion resistance before treatment ,using plain weave 1/1.

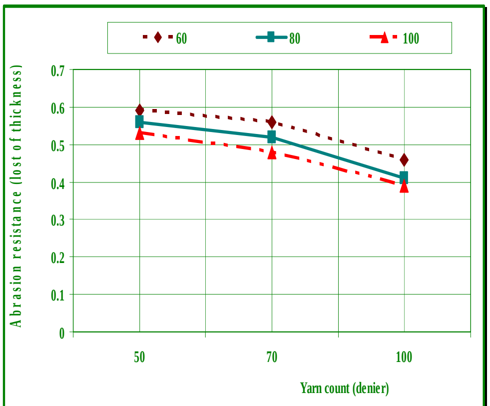

Fig.(9) effect of yarn count and weft set on abrasion resistance before treatment ,using satin 5.

Fig.(10) effect of fabric structure and weft set on abrasion resistance before treatment ,using 50 denier

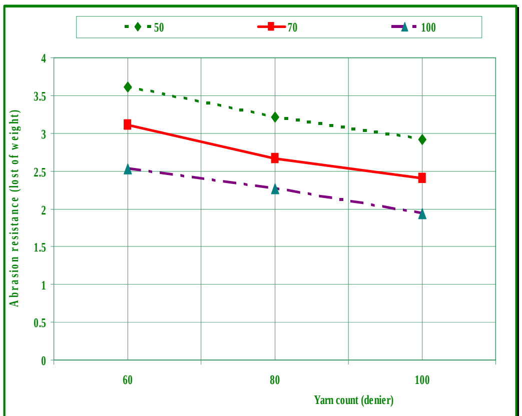

Fig.(11) effect of yarn count and weft set on abrasion resistance before treatment ,using twill 1/4.

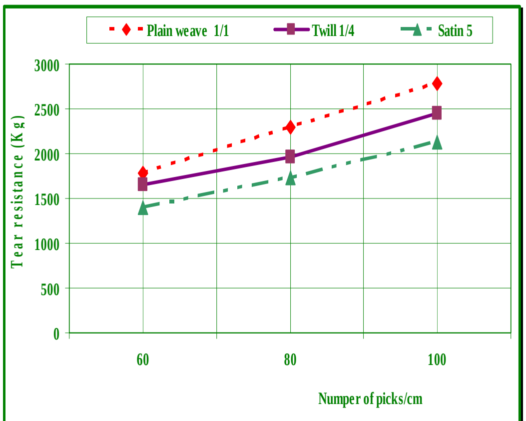

Fig.(12) effect of fabric structure and weft set on tensile strength before treatment using 50 denier

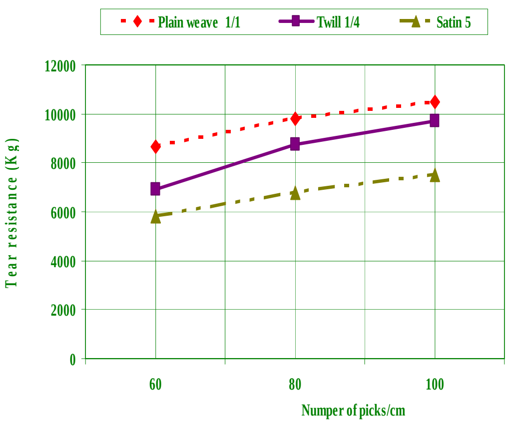

Fig.(13) effect of fabric structure and weft set on tensile strength after treatment using 70 denier

Fig.(14) effect of fabric structure and weft set on tensile strength before and after treatment using 100 denier and twill 1/4.

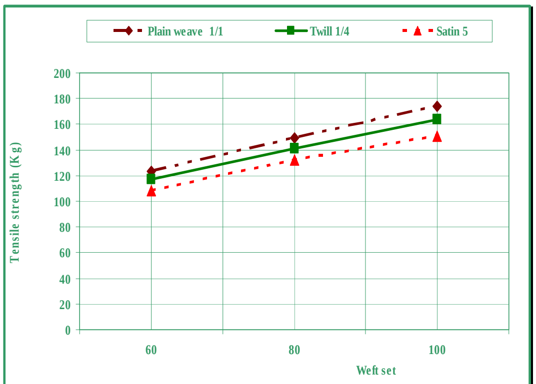

Fig.(15) effect of fabric structure and weft set on tensile strength before treatment ,using polyester 50 denier

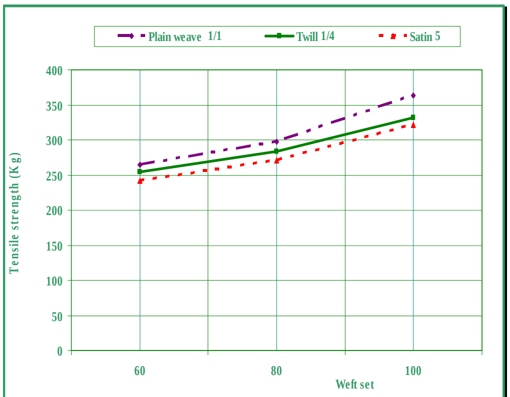

Fig.(16) effect of fabric structure and weft set on tensile strength after treatment ,using polyester 70 denier

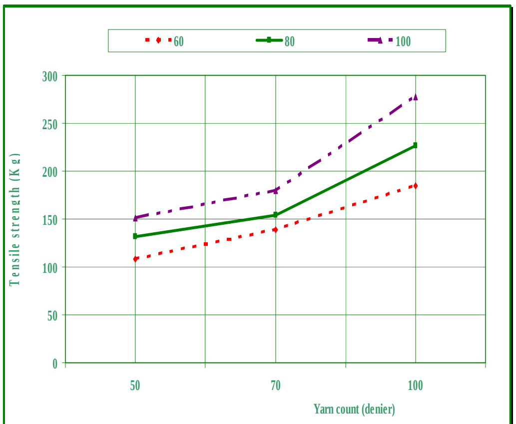

Fig.(17) effect of fabric structure and weft set on tensile strength before treatment ,using satin 5

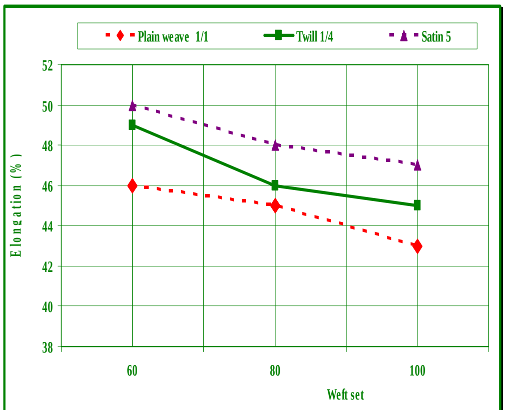

Fig.(18) effect of fabric structure and weft set on elongation after treatment ,using polyester 50 denier

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