V RESULTS AND DISCUSSION

In the present study the effect of abrasive wear of textile under varying conditions of abrasion was studied. Further influence of acrylamide finish on these varying abrasions i.e. flat, rotary, impact and dry-wet impact was also studied. The influence of acrylamide finish on other properties of textiles was also included.

Results on these are discussed as follows:

5.1 Preliminary data of fabrics used.

5.2 Description of finish and chemicals used.

5.3 Comparison of effects of different abrasions.

5.4 Effect of varying abrasion on fabrics.

5.5 Influence of acrylamide finish on different abrasive wear of fabrics.

5.6 Influence of acrylamide finish on some other properties.

5.1 Preliminary data of fabrics used

The preliminary fabric data on fibre content, fabric weight per unit area, fabric count and thickness have been given in Table 2.

5.2 Description of chemicals and finish used

Acrylamide finish was used in the present study. It is a white crystalline solid with melting temperature of 84°C to 85°C.

Table 2: Preliminary data of the fabrics

Fabric code	Fibre content	Fabric count yarns/inch (yarns/cm) Warp	Weft	Weight per unit area oz/sq yard (gm/sq metre)	Thickness inches (cm)
A	100 % C	102	84	2.000	.003
		(40)	(33)	(70.00)	(.0012)
		112	100	2.003	.004
		[44]	[40]	[70.24]	[.0016]
B	67 % P	120	84	2.909	0.003
	33 % C	(48)	(33)	(102.0)	(0.0012)
		119	82	2.920	.004
		[47]	[32]	[102.4]	[.0016]
C	50 % P	68	59	2.855	.006
	50 % P	(28)	(24)	(100.0)	(.0024)
		67	46	3.224	.006
		[28]	[19]	[114.64]	[.0024]

C = Cotton ; P = Polyester

Note: Figures given in square brackets [ ] are for the new lot of fabrics.

Acrylamide finish is now being used by many researchers (12, 14, 21, 28 and 40). It polymerises very easily on cellulose and improves certain properties like abrasion resistance, stiffness, pilling, wrinkle resistance etc. Acrylamide finish is being used with sodium thiosulphate and glyoxal ammonium persulphate redox system (12). In the present study acrylamide finish was used along with the above mentioned redox system and hydrogen peroxide was also used.

Acrylamide finish was prepared in four concentrations - 2.5, 5.0, 7.5 and 10 percent.

Other chemical agents - sodium thiosulphate, hydrogen peroxide, glyoxal and ammonium persulphate were used in concentration of 1.0 percent.

Teepol, 1g/l was used as emulsifying agent. Finish was prepared at 45°C to 50°C (30 minutes).

Samples were padded on padding mangle and were dried in oven at 45°C - 50°C temperature.

Then the fabric samples were cut from each fabric and subjected to different abrasion to study their resistance towards each type of abrasion.

5.3 Comparison of the effect of different abrasions

In the present study abrasive wear of textiles under varying conditions of abrasion was studied and those were flat, rotary, impact and dry-wet impact abrasion./..

abrasion. The varying abrasions studied were:

5.3.1 Flat abrasion

5.3.2 Rotary abrasion

5.3.3 Impact abrasion

5.3.4 Dry-wet abrasion

5.3.1 Flat abrasion

In flat abrasion a sample of fabric is abraded on a standard abradant under pressure with cyclic planar motion, in the form of lissajous figure which is the resultant of two simple harmonic motion at right angles to each other. The resistance to abrasion is measured by the number of cycles required to breakdown or by loss in weight. In the present study fabric A, B and C were abraded against emery cloth under the load of 500 gms and strength loss was estimated. Low strength loss indicates good abrasion resistance. To keep uniformity in the method of assessment it was used for other abrasions also.

5.3.2 Rotary abrasion

In rotary abrasion the sample was impelled round a cylindrical chamber by a centrally mounted rotor. The motion caused the fabric to be bent, flexed, stretched, compressed and rubbed against the chamber wall. The wall was lined with a metal abradant. A high force impact produced by operating at high speed caused sample mass/..

mass damage.

Evaluation is made on the basis of weight loss of the sample or strength loss of the sample broken at the abraded edge, or on the basis of change in other properties such as air permeability, light transmission, visual appearance, hand etc depending on the type of fabric and its intended end use. Generally flat woven fabrics should be tested by the grab breaking strength loss method, while tuffed and "three dimensional" fabrics should be tested by the weight loss method (5), but in the present study strength loss was estimated after rotary abrasion.

5.3.3 Impact abrasion

In the impact abrasion the sample was subjected to a cyclic loading treatment (WIRA Dynamic Loading Machine). Here metal piece of weight 1279 gms with two steel feet below, repeatedly dropped from the height of 63.5 mm freely on to the sample. The spacing traversed so that vertical shearing force is produced by the edge of the feet on the requisite area of sample.

The procedure specifies that the thickness (of the carpet being the specimen) is measured before and after impact. But in the present study strength loss was estimated before and after the samples were impacted.

5.3.4/..

5.3.4 Dry-wet abrasion

In dry-wet abrasion, samples were subjected to dry and wet impact abrasion in the similar way as described above. WIRA Dynamic Loading Machine is used for evaluating the thickness of the carpet, whereas this impact abrasion tester machine was used for evaluating the abrasion properties which simulate dhobiwash. A wooden piece of 1100 gms repeatedly dropped from a height of 23 cm. on the dry-wet samples for the required impacts. Samples were tested for strength loss after dry and wet abrasion.

Dhobiwash is a kind of laundry process, where heavily soiled garments are cleaned with the help of impacts. The garments get compressed due to impact force and soil is released or expelled from garments as the impact force is removed.

5.4 Effect of varying abrasion of fabric A, B and C

Effect of varying abrasions was studied as discussed above by varying the abrasions, flat, rotary, impact and dry-wet impact abrasions. Strength loss was estimated after all types of abrasion of the fabrics. Results are discussed as follows:-

5.4.1 Effect of flat abrasion on fabric A, B and C

a. Effect of flat abrasion on fabric A:

The results are given in Tables 3a, 3b and shown in Fig. 1.

It was found that flat abrasion caused severe damage to fabric A as shown in Fig. 1. Fabric A had shown 6kg strength loss after 500 rubs. Thereafter the strength loss was gradual i.e. 2kg after every 500 rubs. Fabric A lost 48 percent strength (9.9 kg) after 2000 rubs. So for after every 40 to 50 rubs there was an average one kg loss in the strength of fabric. Subsequently there was more strength loss as the flat abrasion increased.

b. Effect of flat abrasion on fabric B :

The results are given in Tables 3a, 3b and shown in Fig. 2.

Flat abrasion caused less damage to fabric B. As shown in the Fig. 2 that there was a loss of 3.3kg after 500 rubs, thereafter subsequent 500 rubs, the strength lost rapidly. The strength loss was more, by 3.7 kg, 6.0 kg and 9 kg after every 500 rubs. So by the time fabric was abraded with 2000 rubs, it had lost 22 percent (9kg) of tensile strength.

c. Effect of flat abrasion on fabric C

The results are given in Table 3a, 3b and shown in/..

in Fig. 3.

The effect of flat abrasion on tensile strength of fabric C was much similar to that on fabric A, but unlike to that on fabric B. This was due to not only lower polyester content of fabric C but also uneven yarn structure in fabric C. Thick yarns were compressed and damaged more severely.

As shown in Fig. 3 it was noted that fabric C lost 7 kg strength after 500 rubs and later the strength loss was less. There was 57 percent (12.4 kg) strength loss after 2000 rubs which was more as compared with other two fabrics A and B.

Results on elongation are given in Table 21 and shown in Figs. 8, 10, 12. It was noted that as the flat abrasion increased there was not much increase in elongation but elongation increased with the increasing load. Results on elongation were similar for all fabrics.

Table 3a: Tensile strength of untreated fabrics after flat abrasion.

Fabric code	Cotton (A)	Polyester/cotton (67/33) (B)	Polyester/cotton (50/50) (C)
Strength (kg/2.5cm) No of rubs	kg	kg	kg
0	19.0	41.0	22.0
500	13.2	37.7	15.1
1000	11.8	37.3	12.3
1500	10.5	35.0	10.6
2000	9.9	32.0	9.6

Table 3b: Tensile strength of untreated fabrics after flat abrasion.

Fabric code	Cotton (A)	Polyester/cotton (67/33) (B)	Polyester/cotton (50/50) (C)
Strength (%) No of rubs	(%)	(%)	(%)
0	100.0	100.0	100.0
500	69.5	91.75	68.6
1000	62.1	90.75	55.9
1500	55.2	85.36	48.1
2000	52.1	78.04	43.6

Note: 19kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
22kg - Original strength, 100% (Fabric C)

Effect of varying abrasion (Flat, Impact & Rotary) on Fabric A

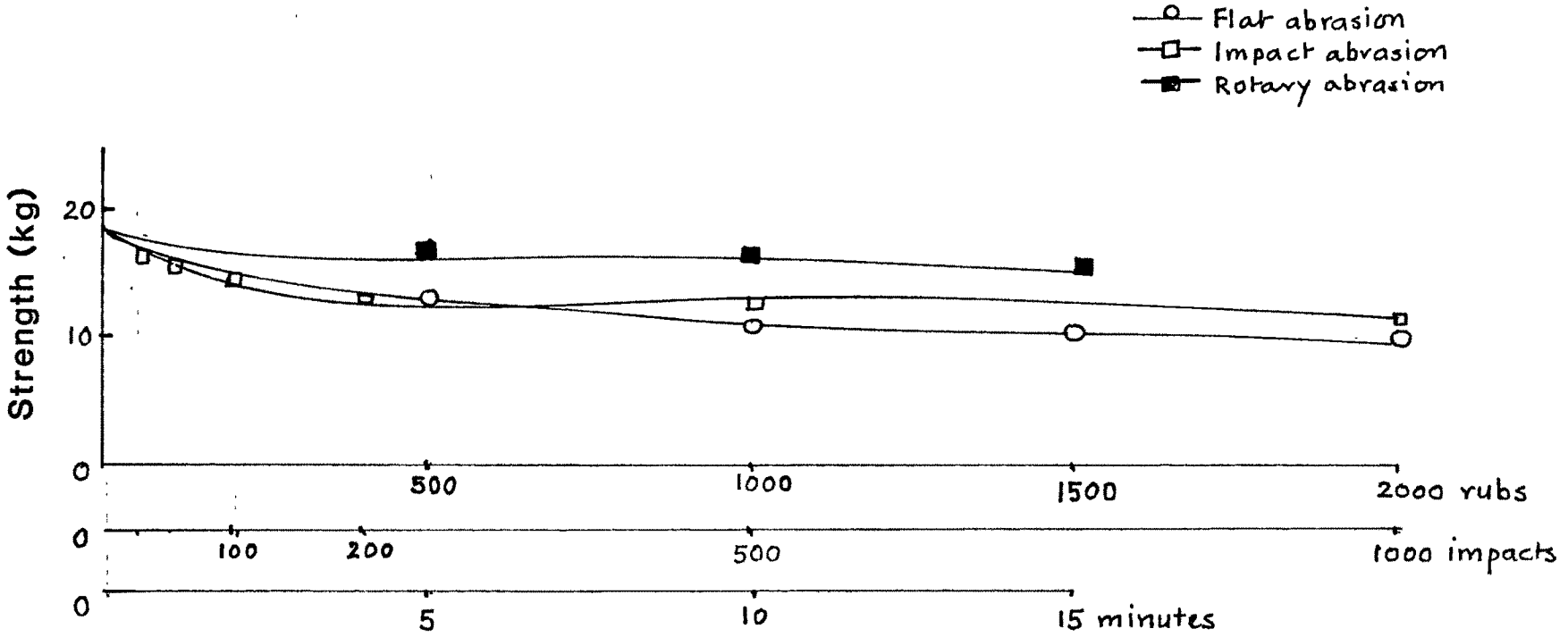


Fig. I

5.4.2 Effect of rotary abrasion on the fabrics A, B and C

a. Effect of rotary abrasion on fabric A:

Results are given in Tables 4a, 4b and shown in Fig. 1.

It was found that rotary abrasion had caused less damage to fabrics as compared to flat abrasion. Results were similar for both fabric A and C as there was loss of strength of 4 kg within 5 minutes of rotary abrasion.

b. Effect of rotary abrasion on fabric B:

Results are given in Tables 4a, 4b and shown in Fig. 2.

Fabric B lost only 3 kg strength of fabric after 5 minutes abrasion. Then there was loss of one kg after 5 more minutes of rotary abrasion.

c. Effect of rotary abrasion on fabric C:

Results are given in Tables 4a, 4b and shown in Fig. 3.

It was noted that fabric C had lost nearly 20 percent (4 kg) strength similar to fabric A, whereas fabric B had lost 10 percent (4 kg) of its strength after 15 minutes of rotary abrasion.

As evident from Figs. 14. 16 and 18 and Tables 21, 22a, 22b and 23 as the rotary abrasion increased there was little increase in elongation for all fabrics. As per the test, elongation increased at increasing loads.

Table 4a: Tensile strength of untreated fabrics after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Time (min)	Kg	Kg	Kg
0	19.0*	41.0*	22.0*
5	17.0	38.0	21.0
10	16.3	37.0	19.0
15	15.0	36.9	18.0

Table 4b: Tensile strength of untreated fabrics in percentage after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Time (min)	%	%	%
0	100.0	100.0	100.0
5	89.47	92.68	95.45
10	85.78	90.48	87.27
15	78.94	90.10	81.81

Note: 19 kg - Original strength, 100% (Fabric A)
41 kg - Original strength, 100% (Fabric B)
22 kg - Original strength, 100% (Fabric C)

Effect of varying Abrasion (Flat,Impact&Rotary) on Fabric B

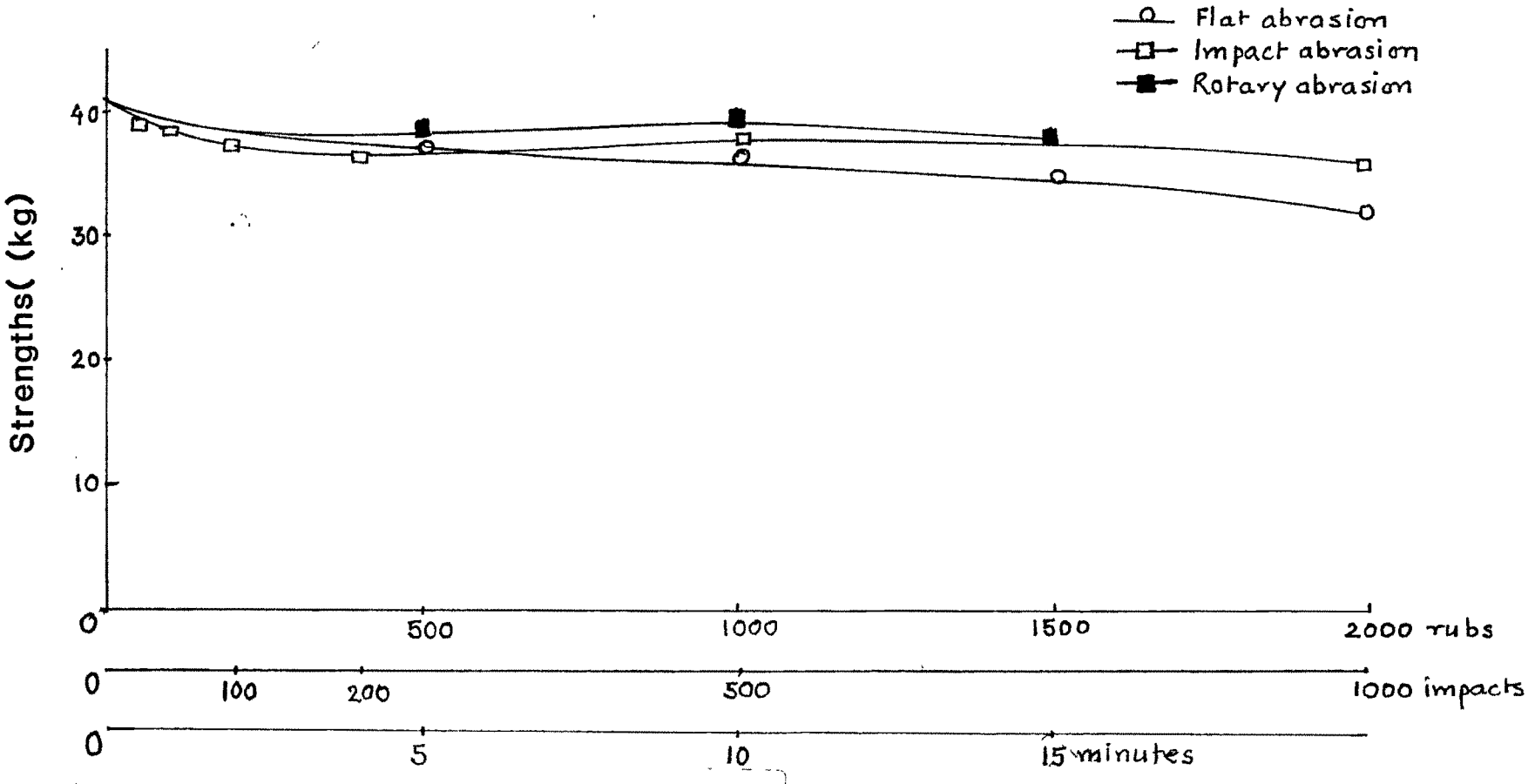


Fig.2

5.4.3 Effect of impact abrasion on fabric A, B and C

a. Effect of impact abrasion on fabric A:

Results are given in Tables 5a and 5b and shown in Fig. 1.

It was found that effect of impact abrasion was less severe than flat abrasion for all fabrics. Fabric A showed 3.4 kg strength loss after 25 impacts and then there was gradual loss of strength i.e. one kg loss after 50, 100, 200, 500 and 1000 impacts. The fabric has shown 35 percent strength loss (6 kg) after 1000 impacts.

b. Effect of impact abrasion on fabric B:

Results are given in Tables 5a and 5b and shown in Fig. 2.

In the case of fabric B it was found that there was 3 kg loss after 25 impacts. Similar to fabric A, there was 1-2 kg strength loss at increasing levels of impact i.e. 50, 100, 200, 500 and 1000 impacts. So by the last level i.e. 1000 impacts, fabric had lost 13 percent (5.4 kg) of its strength.

c. Effect of impact abrasion on fabric C.

Results are given in Tables 5a and 5b and shown in Fig. 3.

In the case of fabric C, it was found that there was 2 kg strength loss after 25 impacts. Then with increasing impacts, the strength loss also increased by/..

by 1-2 kg. The fabric had lost 25 percent strength (6 kg) after 1000 impacts.

There was little increase in elongation with increased arasion but there was increase in elongation at increasing load for all fabrics. The results are given in Tables 21, 22a, 22b and 23 and in Figs. 20, 22 and 24.

Table 5a: Tensile strength of untreated fabrics after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm No. of Impact	Kg	Kg	Kg
0	19.0*	41.0*	22.0*
25	15.6	38.0	20.0
50	14.1	37.6	19.2
100	13.6	37.6	18.9
200	13.0	36.6	18.3
500	13.0	36.0	16.8
1000	12.2	35.6	16.3

Table 5b: Tensile strength of untreated fabrics after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) No. of Impact	%	%	%
0	100.0	100.0	100.0
25	82.1	92.6	90.9
50	74.2	91.46	87.0
100	71.5	91.46	85.9
200	68.4	89.28	84.0
500	68.4	87.80	76.0
1000	64.2	86.82	74.0

Note: 19 kg - Original strength, 100% (Fabric A)
41 kg - Original strength, 100% (Fabric B)
22 kg - Original strength, 100% (Fabric C)

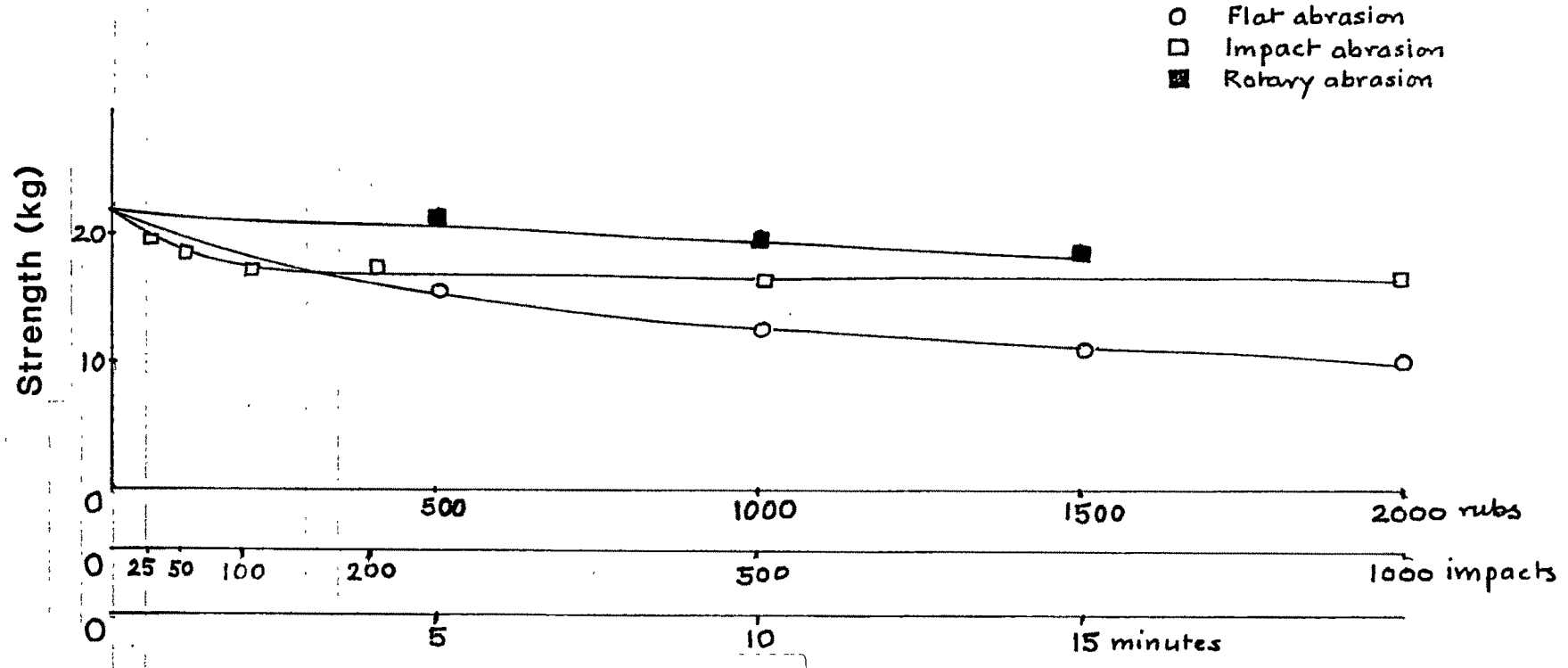

Effect of varying abrasion (Flat,Impact&Rotary) on Fabric C
Flat abrasion
Impact abrasion
Rotary abrasion
Strength (kg)
20
10
0
500
1000
1500
2000 rubs
0
25 50 100 200
500
1000 impacts
0
5
10
15 minutes

Fig.3

5.4.4 Effect of dry-wet impact abrasion on fabrics A, B and C

The dry and wet impact abrasion caused similar effect as in the case of other impact abrasion. This is discussed aove, (5.4.3) and was studied on WIRA Dynamic Loading Machine in U.K. All the three farics A, B and C had shown damage with impact abrasion. Similar damage was also noted to the new fabrics A, B and C by dry-wet impact abrasion. Since they were varying very little in their preliminary data.

The dry and wet impact abrasion in this section simulates dhobiwash.

a. Effect of dry-wet abrasion on fabric A:

Results are given in Table 18 and shown in Fig. 4.

In the case of fabric A it was found that as the dry impact abrasion increased the strength loss also increased. There was loss of 1.4 kg strength of fabric after 50 impacts. Thereafter the strength loss was very less. At last level i.e. 1000 impacts, the strength loss was 2.4 percent (3.9 kg).

Results were similar in wet abrasion. Untreated fabric A had shown strength loss of 1-2 kg up to 500 impacts and 3 kg up to 1000 impacts, whereas treated fabric A had shown 1-2 kg strength loss up to 200 impacts and 3 kg strength loss up to 1000 impacts, which was less by 1 kg as compared to untreated fabric. So untreated fabric showed 25 percent (3 kg) strength loss/..

loss whereas treated fabric had shown 20 percent (3 kg) strength loss.

b. Effect of dry-wet abrasion on fabric B:

Results are given in Table 19 and shown in Fig. 5.

In the case of untreated fabric B, dry impact abrasion had caused very less damage to the fabric as there was strength loss of only 1.2 kg after 50 impacts. Then after 100 impacts, loss of strength was very little. Loss of strength after 1000 impacts was 19 percent (6 kg). Similar results were obtained with wet abrasion. Differences in strength loss of dry and of wet abraded samples were very marginal. It was less than 1 kg i.e. dry abraded sample had 18 percent strength (5.5 kg) loss whereas wet abraded sample of treated fabric B had 13.7 percent strength (5.0 kg) loss after 1000 impacts. Results were similar for other levels i.e. 50, 100, 200, 500 and 1000 impacts.

c. Effect of dry-wet abrasion on fabric C:

Results are given in Table 20 and shown in Fig. 6.

In the case of fabric C strength loss was 2.4 kg after 50 dry impacts. Then strength loss was 2.73 kg after 100 impacts, 3.41 kg after 200 impacts, 3.40 kg after 500 impacts and 4.68 kg after 1000 impacts. The fabric showed 25 percent strength loss (4.6 kg) after 1000 impacts.

Similar/..

Effect of Acrylamide finish on tensile strength

(Dry & Wet impact abrasion–Fabric A)

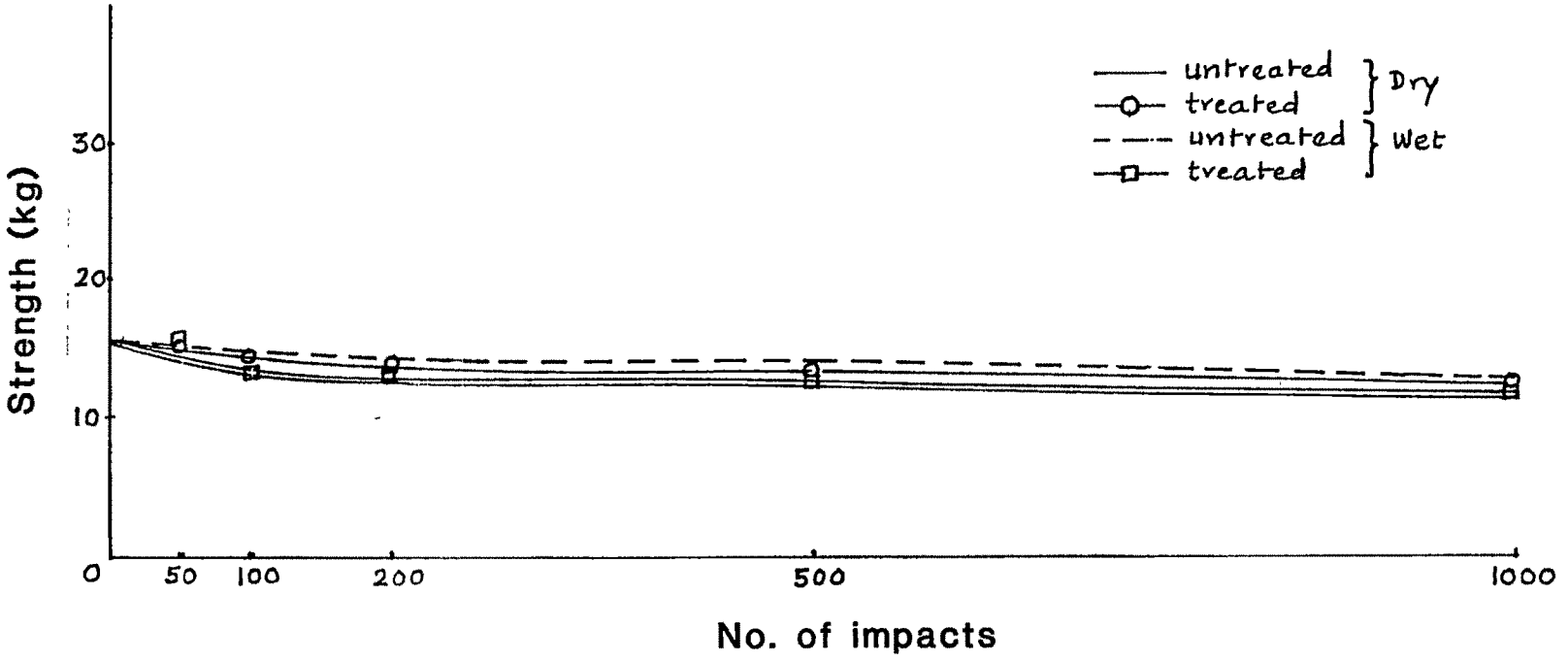


Fig4

Effect of Acrylamide finish on tensile strength

(Dry & Wet impact abrasion-Fabric B)

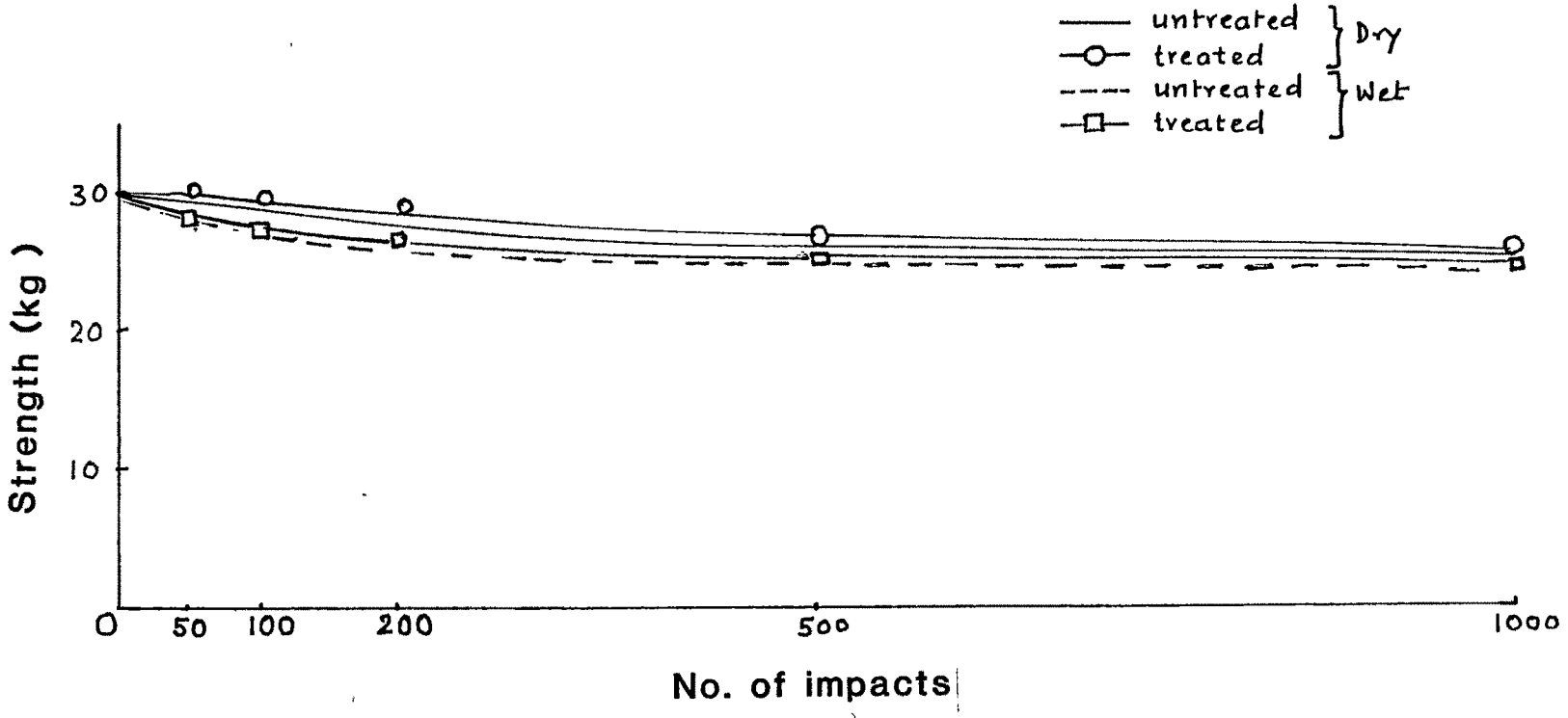


fig.5

Effect of Acrylamide finish on tensile strength

(Dry & Wet impact abrasion-Fabric C)

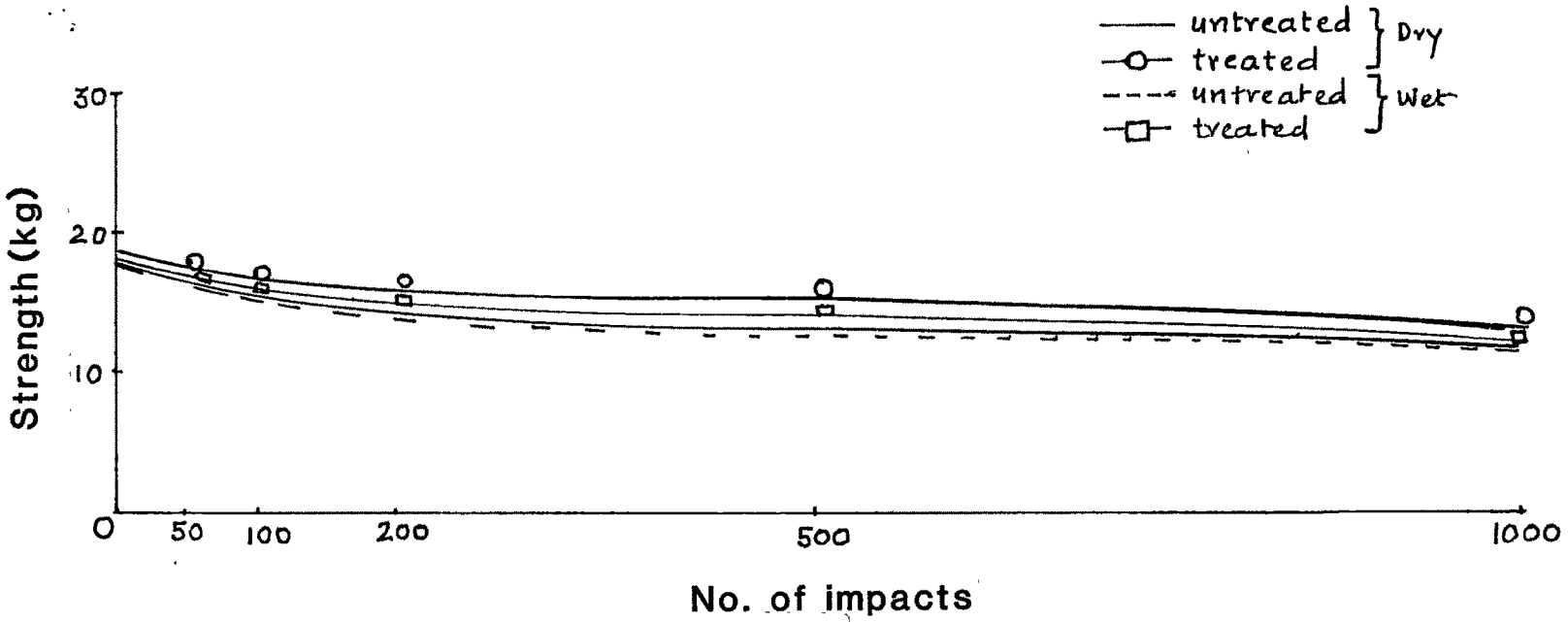


Fig.6

Similar results were found in wet impact abrasion for fabric C. When compared with each level, there was difference of 2.5 kg strength loss after 100 impacts, 3.64 kg after 200 impacts and 4.70 kg after 1000 impacts. Thus there was little difference. Fabric showed 26 percent strength loss (4.8 kg) with wet impact abrasion after 1000 impacts.

Elongation in fabric increased with increasing load and abrasion but specifically little difference was noted.

So, abrading tendency with varying abrasion was studied and it was found that flat abrasion was fast, rotary was slow and impact abrasion was intermediate.

5.5 Influence of acrylamide finish on different abrasion wear of fabrics.

To study the influence of acrylamide finish on the properties of fabrics under varying abrasions, fabrics were treated with acrylamide finish at four concentrations i.e. 2.5, 5.0, 7.5 and 10.0 percent. Initially the experiment was planned with the use of 5.0 percent and 10.0 percent acrylamide but to see if there was any improvement on abrasion and other properties of fabrics, the work was also carried out with lower than 5.0 (2.5) and in between 5.0 and 10.0 (7.5) percent acrylamide finish. Thus four concentrations were/..

were used.

As evident from Figures 7, 9, 11, 15, 17, 19, 21 and 23 and data in Tables 6a, 6b, 7a, 7b, 8a, 8b, 9a and 9b results obtained with 2.5 percent concentration of acrylamide finish were better than 5.0 percent finish as far as flat abrasion is concerned for fabric A and B. For impact abrasion also the results were better with 2.5 percent than 5.0 percent finish, for fabric B. Results with 7.5 percent concentration were also good. Poor results were obtained with 10.0 acrylamide finish as far as flat abrasion is concerned for fabric A and C. This showed that 10.0 percent finish had remained on the surface only and could not penetrate into fibres as the finish became very much viscous. Therefore idea of using 10.0 percent acrylamide was dropped and later work was carried over with 5.0 percent. With 10.0 percent finish results for other abrasions, i.e. rotary and impact, were good.

5.5.1 Influence of acrylamide finish on fabric A, B and C after flat abrasion

a. Fabric A

As evident from the Fig. 7 and Table 7a and 7b acrylamide finish improved the flat abrasion resistance of fabric A, because the treated fabric had shown decreased strength loss as compared with untreated fabric. At 0 level/..

0 level (unabraded), like untreated fabric, the treated fabric had shown 1 kg loss in strength. But after 500 rubs, the untreated fabric had shown 5.8 kg strength loss whereas treated fabric had shown 5 kg loss with 5.0 percent acrylamide finish.

The strength loss for untreated fabric was nearly 2 kg, 1 kg and 1 kg more than treated fabrics after 1000, 1500 and 2000 rubs respectively.

Elongation was decreased in treated fabric as compared to untreated fabric. It increased along with the increase in abrasion and at increasing load. Results are shown in Fig. 8 and Table 21.

b. Fabric B:

As evident from the Fig. 9 and Tables 7a and 7b, similar results were obtained with fabric B. Acrylamide finish had improved flat abrasion resistance of fabric B. As shown in Fig. 2 and Tables 3a, 3b untreated fabric had lost 3.3 kg strength after 500 rubs, whereas after treatment with acrylamide finish, fabric had lost 1 kg. Then there was loss of 0.40 kg after 500 rubs. There was not much of a difference in strength loss after 1000 and 1500 rubs but after 2000 rubs treated fabric had shown less strength loss by 2.0 kg when compared with untreated fabric.

As shown in Fig. 10 and Table 22a with acrylamide finish, there was decrease in elongation for fabric B. It/..

It did not increase with increased flat abrasion but it increased at increasing loads.

c. Fabric C:

As shown in the Figs. 3 and 11 and Tables 3a, 3b, 7a and 7b untreated fabric had 7.0 kg loss in tensile strength whereas treated fabric had 5.4 kg strength loss after 500 rubs. Then strength loss increased as abrasion increased but still strength loss for treated fabric was less than untreated fabrics. Untreated fabric had shown 12.4 kg loss (56 percent) in strength whereas treated fabric had shown 10.0 kg (43 percent) strength loss after 2000 rubs.

As shown in Figure 12 and Table 23, it was noted that there was decrease in elongation in fabric after treatment of acrylamide finish. It increased at increasing loads and not with the increase of abrasion.

Table 6a: Tensile strength of treated fabric with 2.5% Acrylamide after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Polyester/Cotton (C)
Strength kg/2.5cm Rubs	Kg	Kg	Kg
0	18.0*	41.0*	20.0*
500	16.0	38.0	14.0
1000	16.0	37.5	14.0
1500	15.0	37.0	12.0
2000	12.50	35.5	11.0

Table 6b: Tensile strength of treated fabrics with 2.5% Acrylamide after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Polyester/Cotton (C)
Strength (%) Rubs	%	%	%
0	100.0	100.0	100.0
500	88.88	92.68	70.0
1000	88.88	91.46	70.0
1500	83.33	90.24	60.0
2000	69.44	85.58	55.0

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 7a: Tensile strength of fabric treated with 5 percent acrylamide finish, after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Rubs	Kg	Kg	Kg
0	19.0*	40.00*	22.00*
500	14.0	39.60	16.60
1000	13.0	36.30	16.00
1500	11.0	35.00	14.00
2000	10.0	34.00	12.50

Table 7b: Tensile strength of fabric treated with 5 percent acrylamide finish, after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Rubs	%	%	%
0	100.0	100.0	100.0
500	73.68	99.0	75.54
1000	68.42	87.50	63.63
2000	52.63	86.00	56.81

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 8a: Tensile strength of fabrics treated with 7.5% acrylamide after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Rubs	Kg	Kg	Kg
0	18.0*	40.0*	21.5*
500	16.0	39.0	16.50
1000	15.0	38.66	14.0
1500	14.0	37.66	13.5
2000	12.63	36.50	12.0

Table 8b: Tensile strength of fabrics treated with 7.5% acrylamide after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength % Rubs	%	%	%
0	100.0	100.0	100.0
500	88.88	97.50	76.74
1000	88.33	96.65	65.11
1500	77.77	93.75	60.46
2000	66.66	91.25	55.81

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 9a: Tensile strength of treated fabrics with 10% acrylamide finish, after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Impact	Kg	Kg	Kg
0	18.0*	41.0*	22.0*
50	9.0	38.5	14.0
1000	7.0	38.0	8.0
1500	6.0	37.0	7.0
2000	6.0	35.5	5.0

Table 9b: Tensile strength of treated fabrics with 10% acrylamide finish, after flat abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Impact	%	%	%
0	100.00	100.00	100.00
50	50.00	93.90	63.33
1000	38.88	92.68	36.87
1500	33.33	90.24	31.81
2000	33.33	86.58	22.72

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Effect of varying concentrations of Acrylamide finish on tensile strength (Flat abrasion, Fabric A)

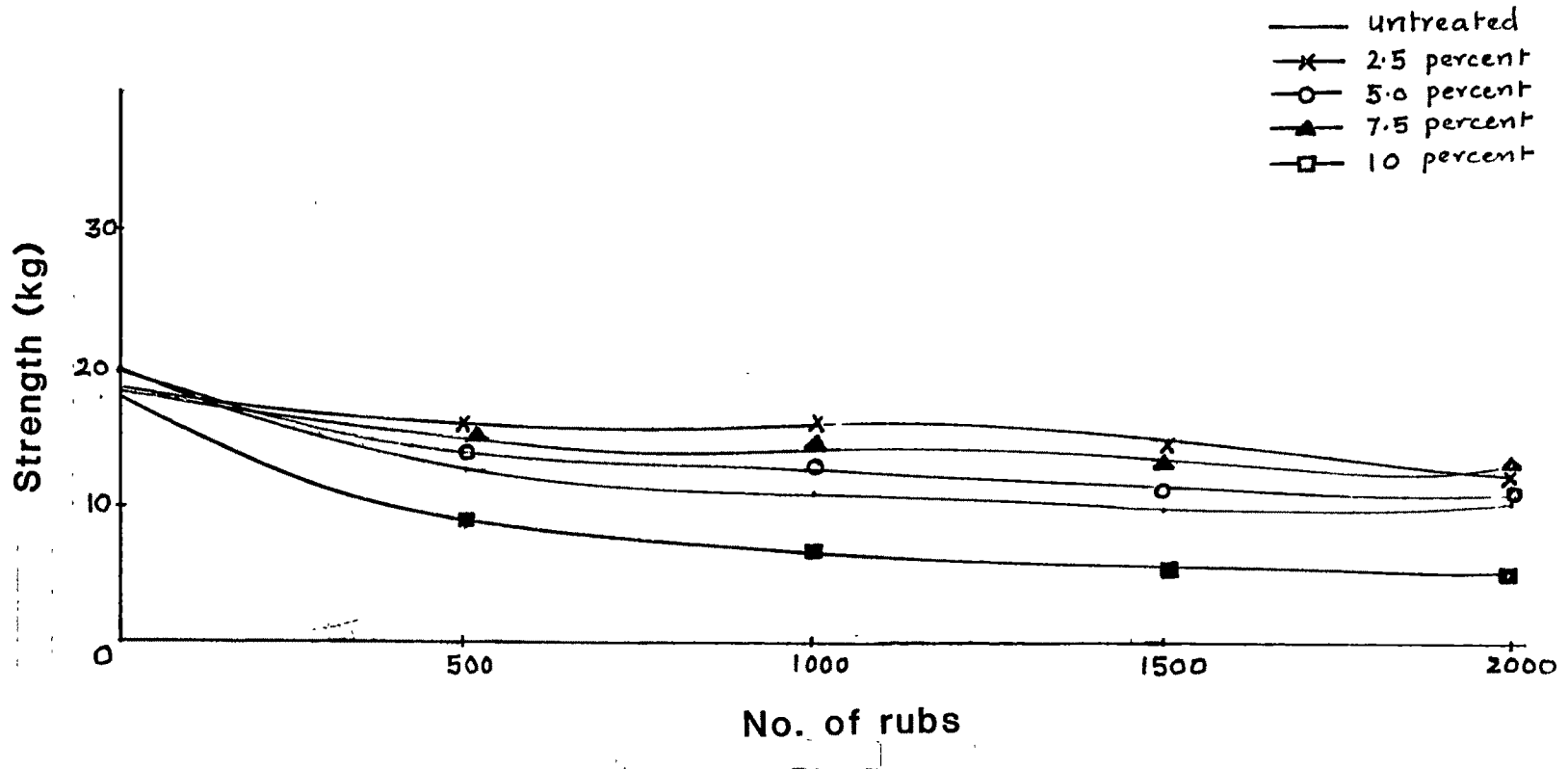
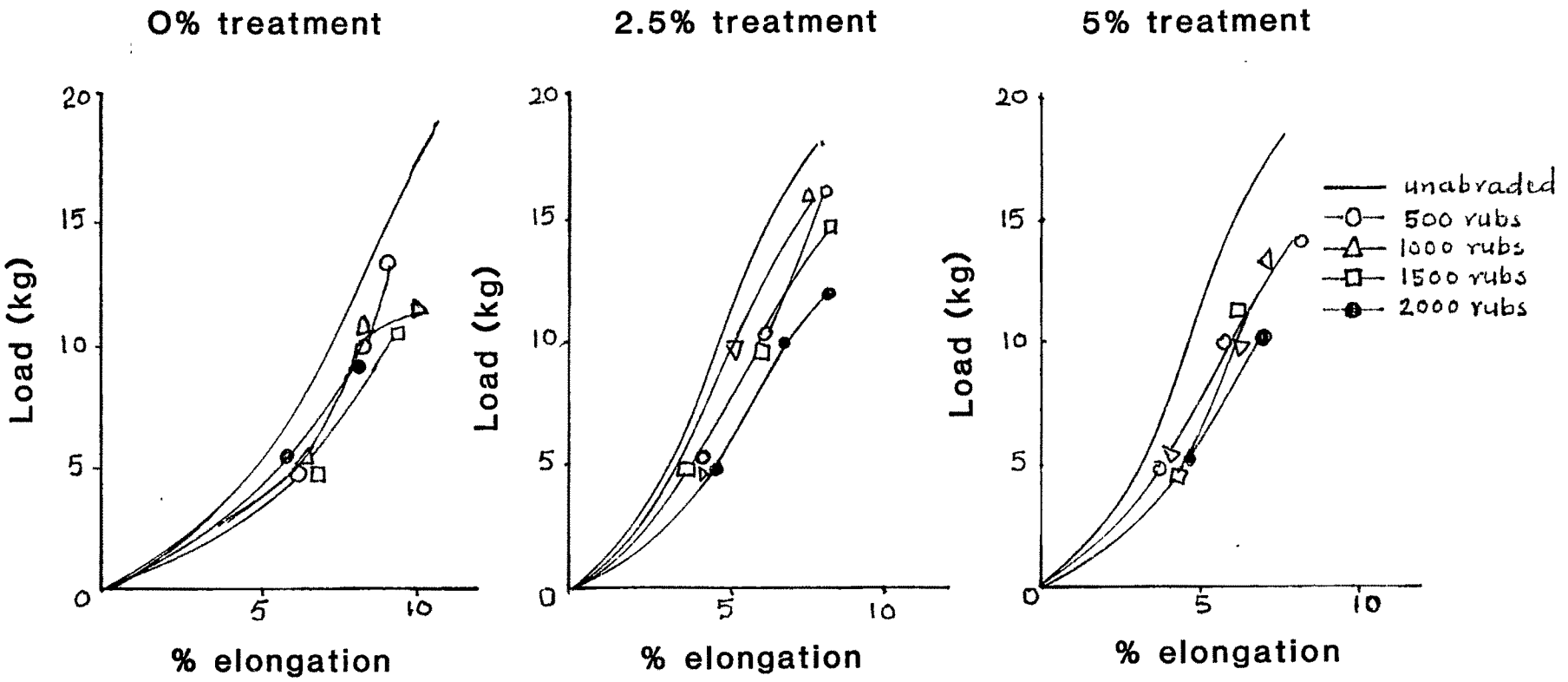


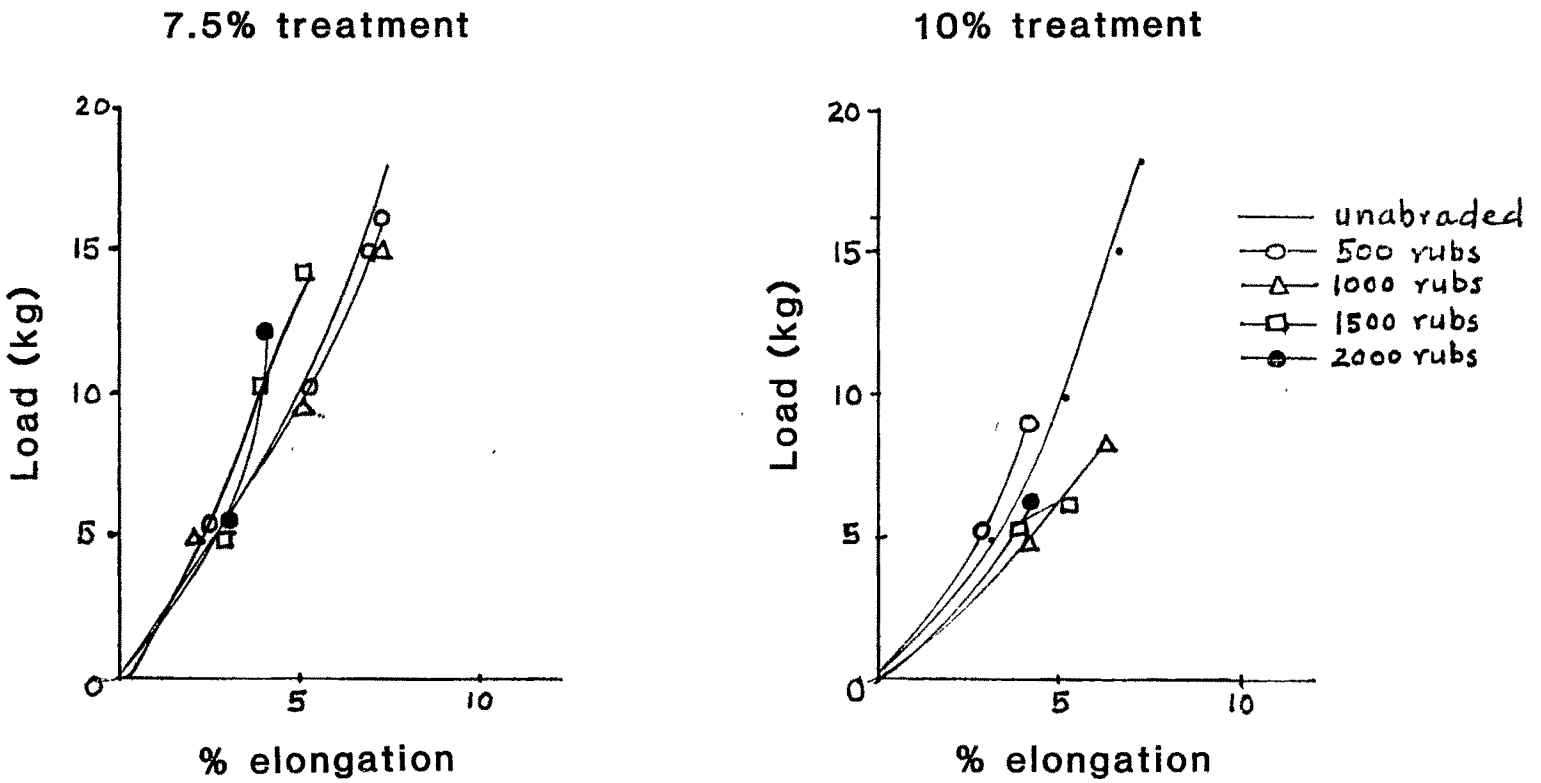
Fig.7

Effect of Acrylamide finish on Load-elongation curve (Flat abrasion, Fabric A)

Fig8



Effect of Acrylamide Finish on Load-elongation curve (Fabric A,Flat abrasion)



Effect of varying concentrations Acrylamide finish

on tensile strength (Flat abrasion, Fabric B)

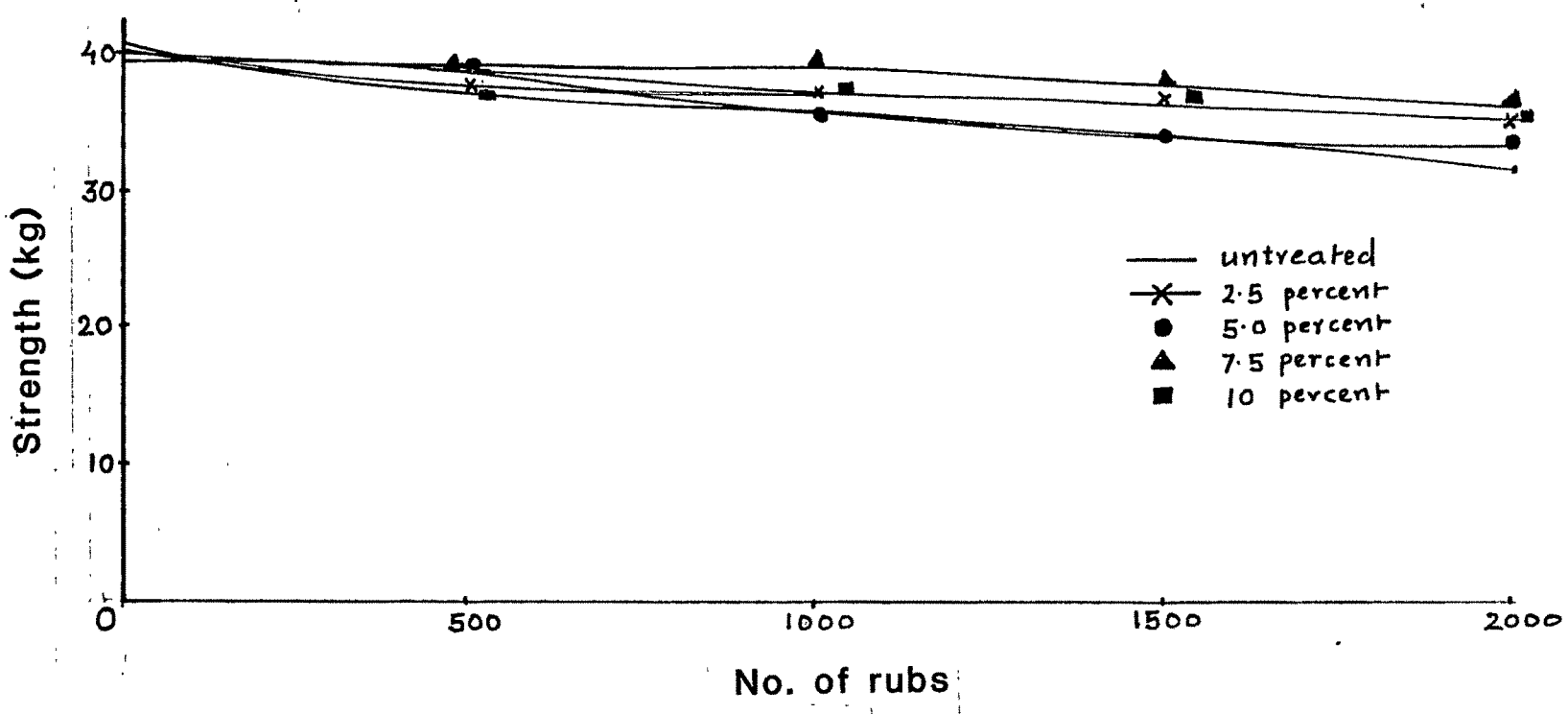
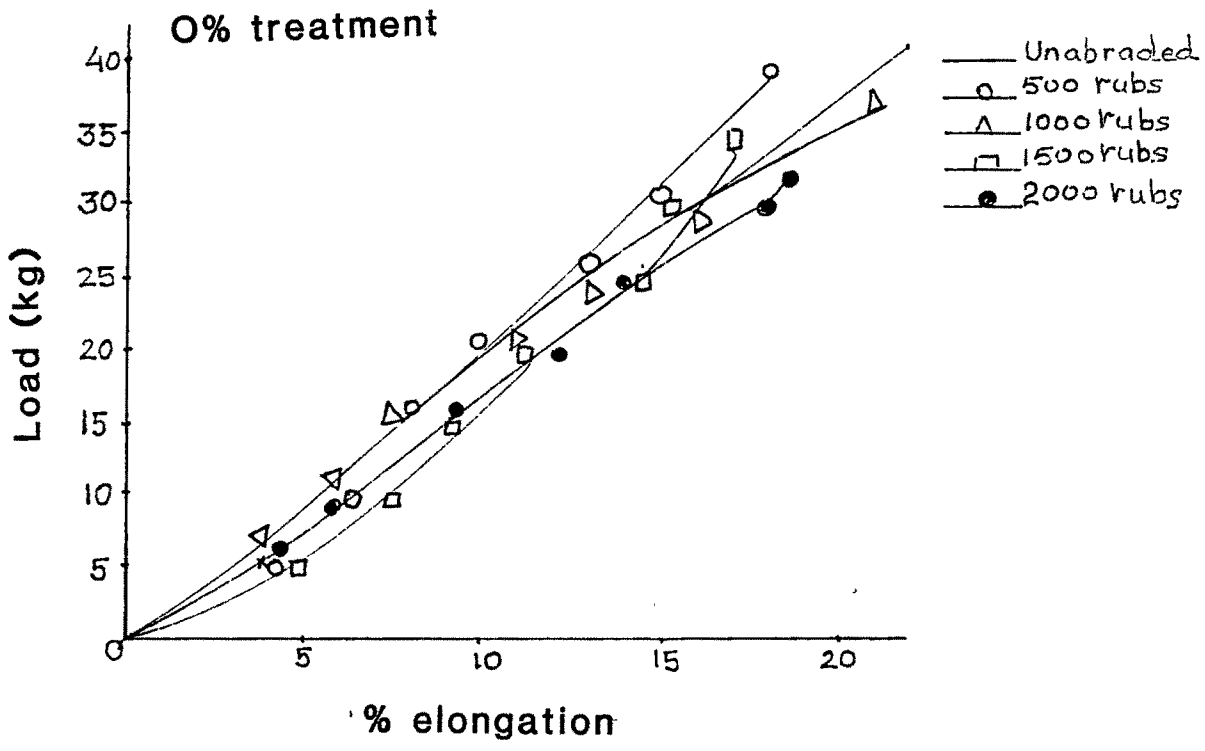
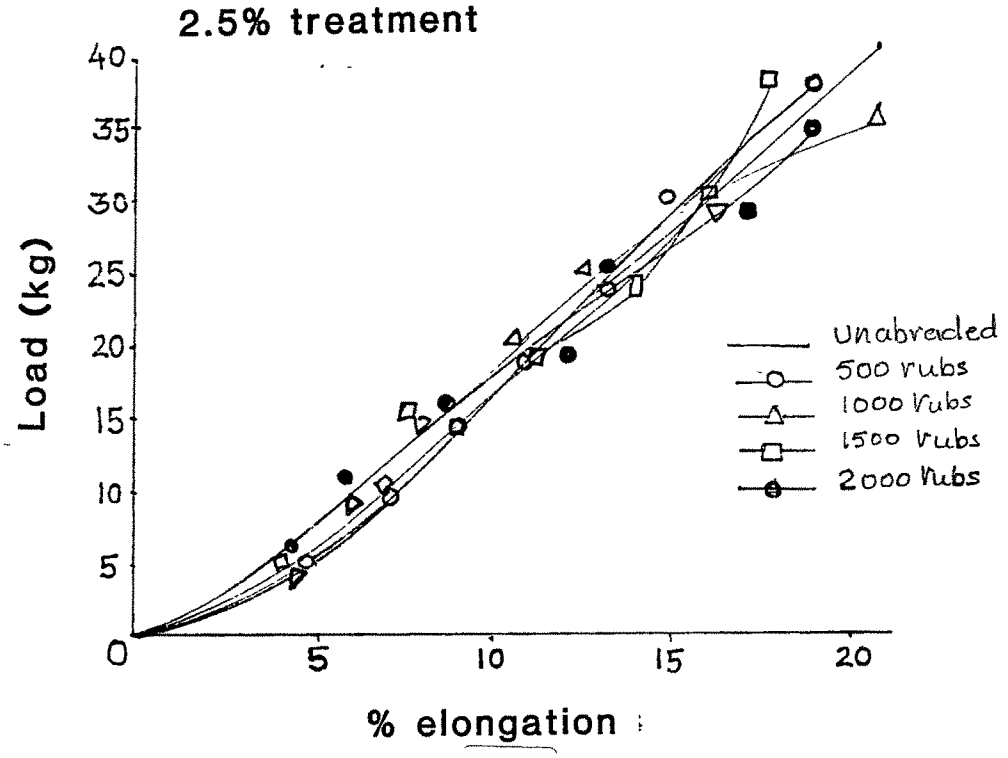


Fig.9

Effect of Acrylamide finish on Load-elongation curve

(Flat abrasion, Fabric B)

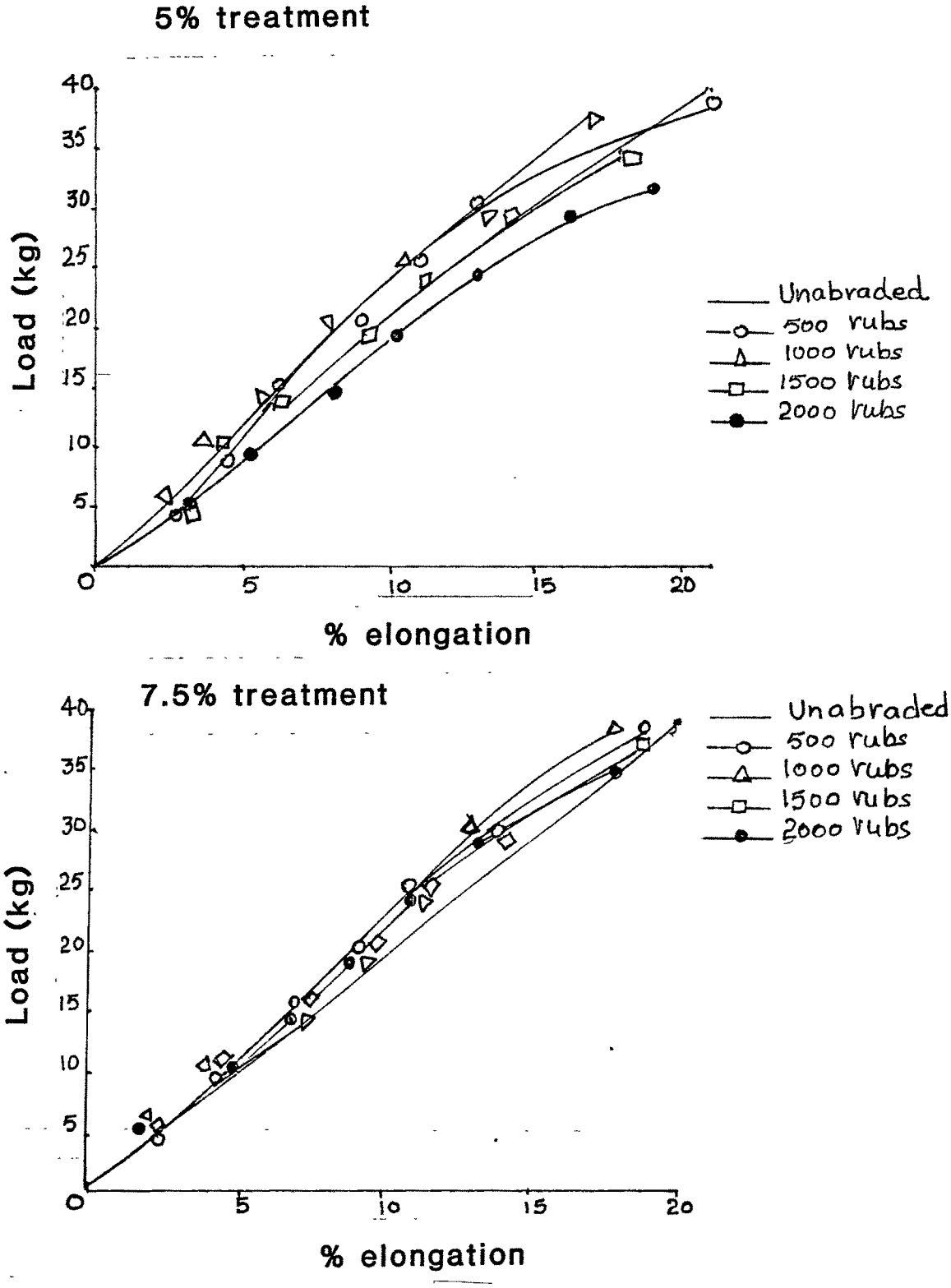




FigI0

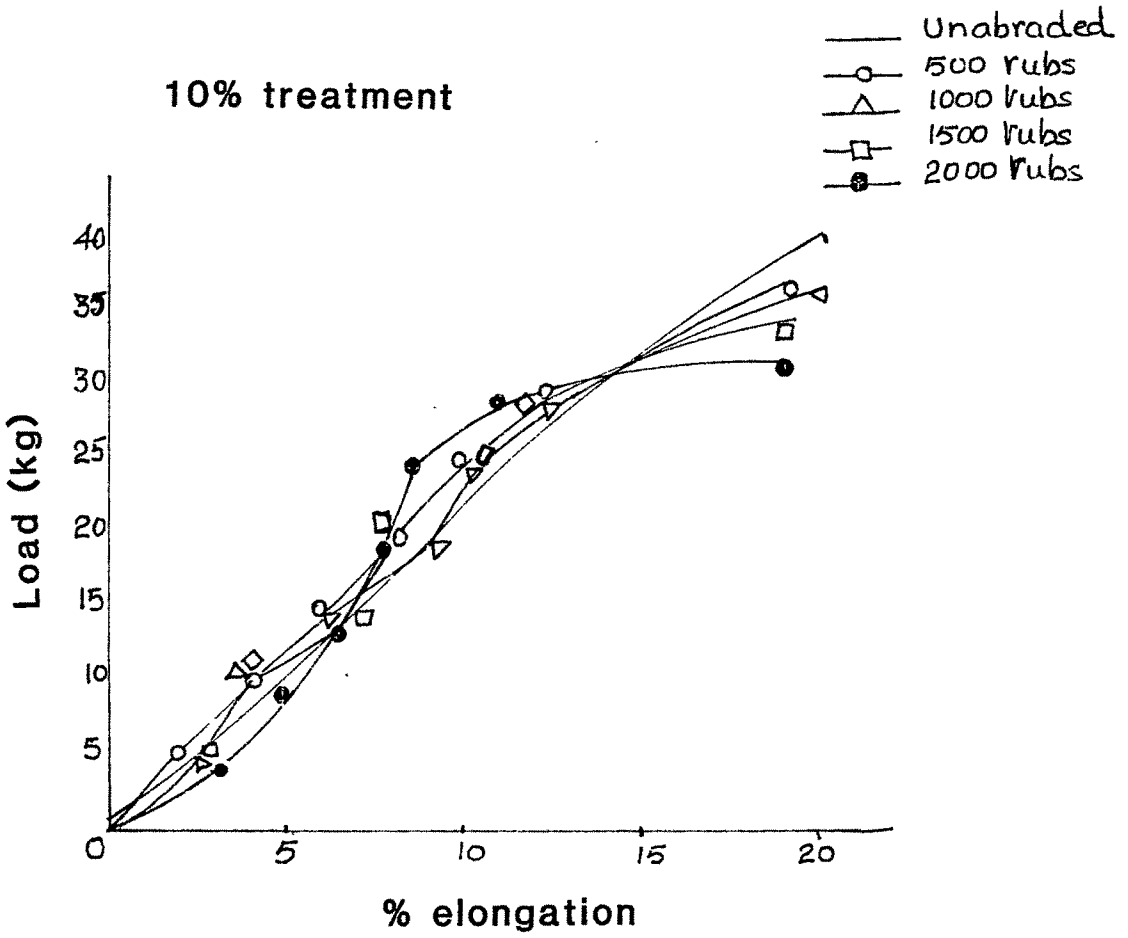
Effect of Acrylamide on Load-elongation curve

(Flat abrasion,Fabric B)



Effect of Acrylamide Finish on Load-elongation curve

(Flat abrasion,Fabric B)



Effect of varying concentrations of Acrylamide finish on tensile strength (Flatabrasion, Fabric C)

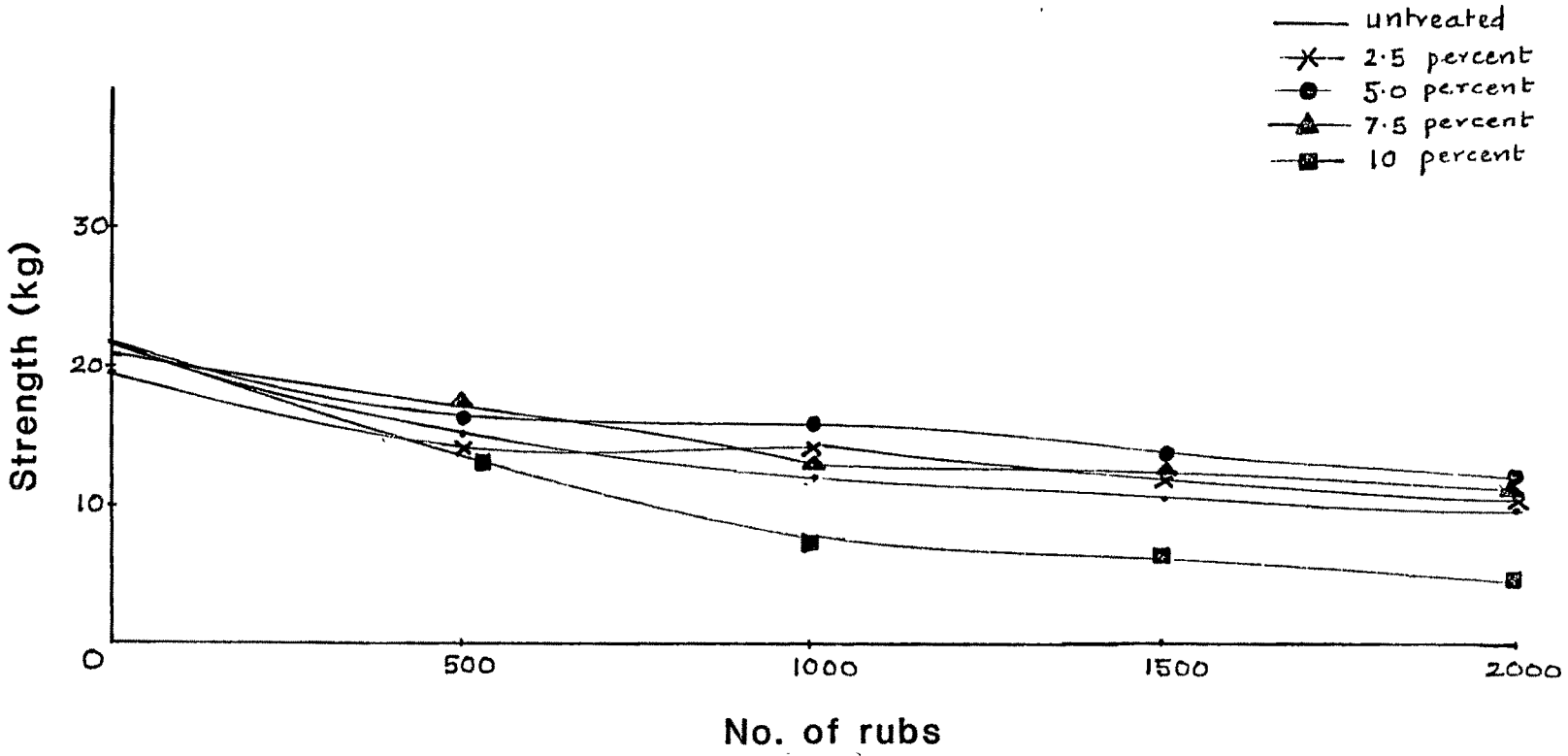


Fig.11

Effect of Acrylamide finish on Load-elongation curve

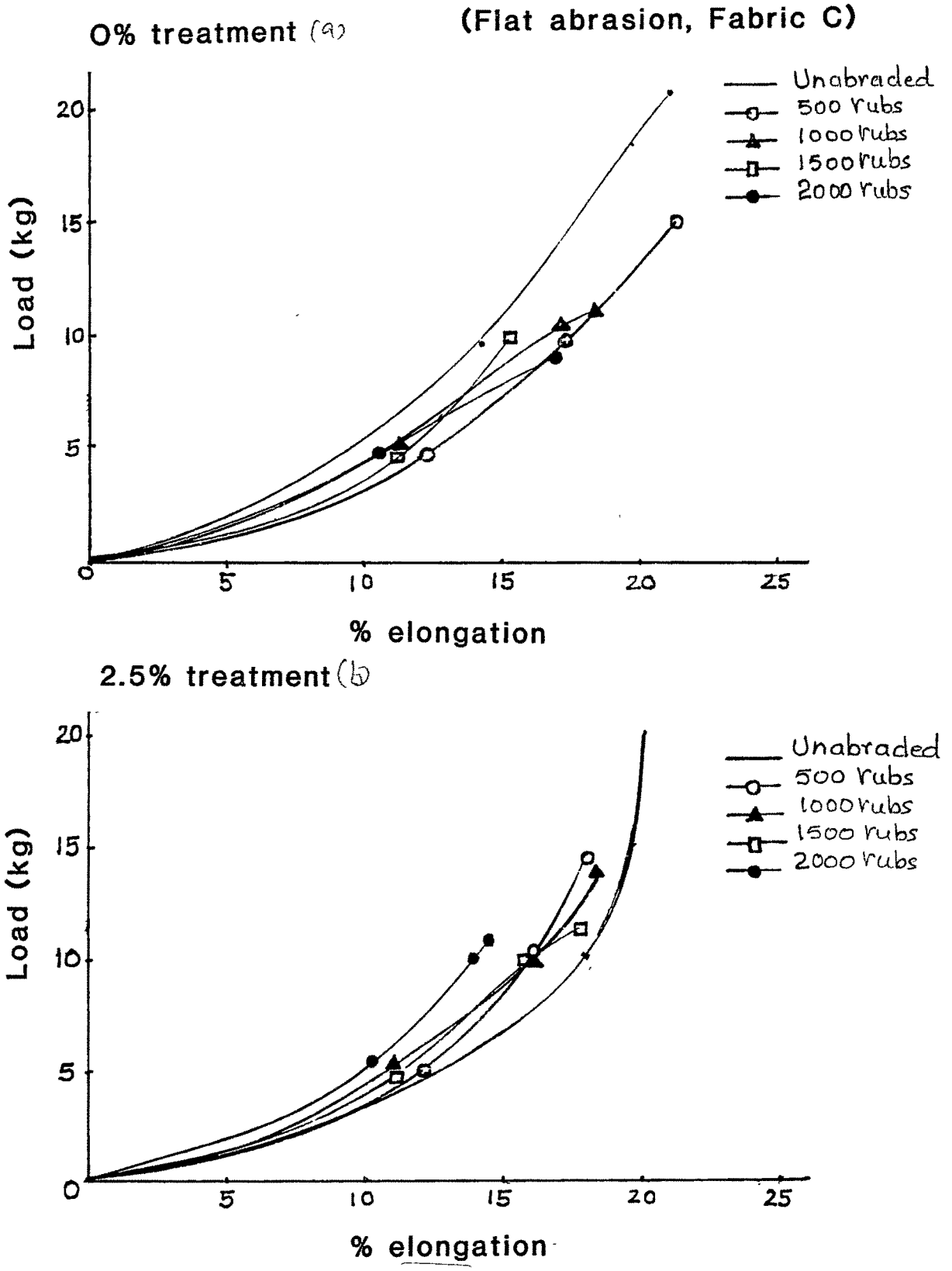
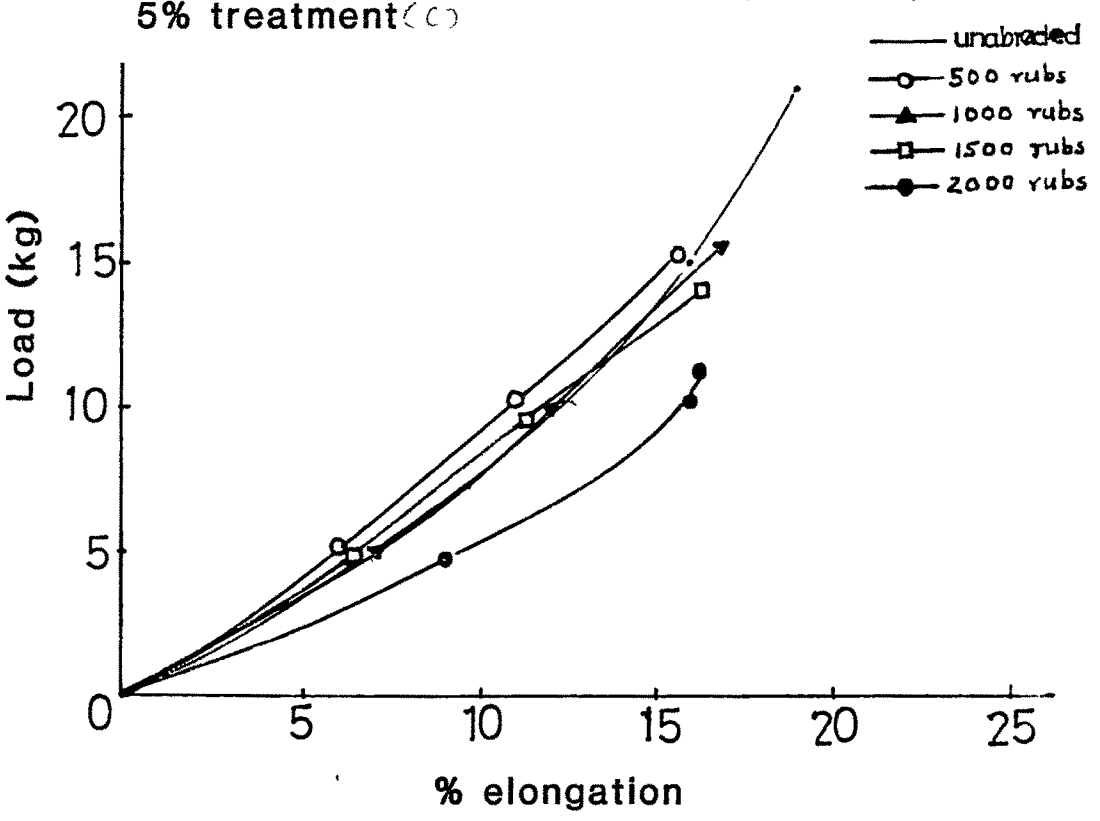
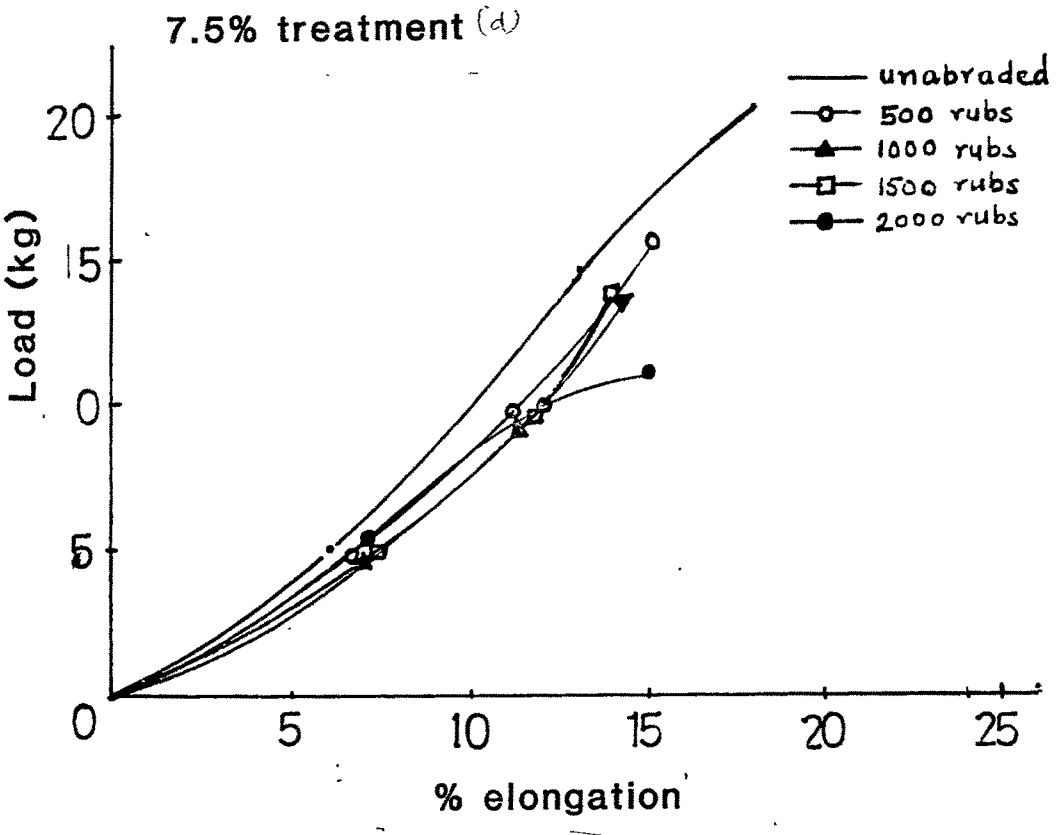


Fig.12

Effect of Acrylamide Finish on Load -elongation curve

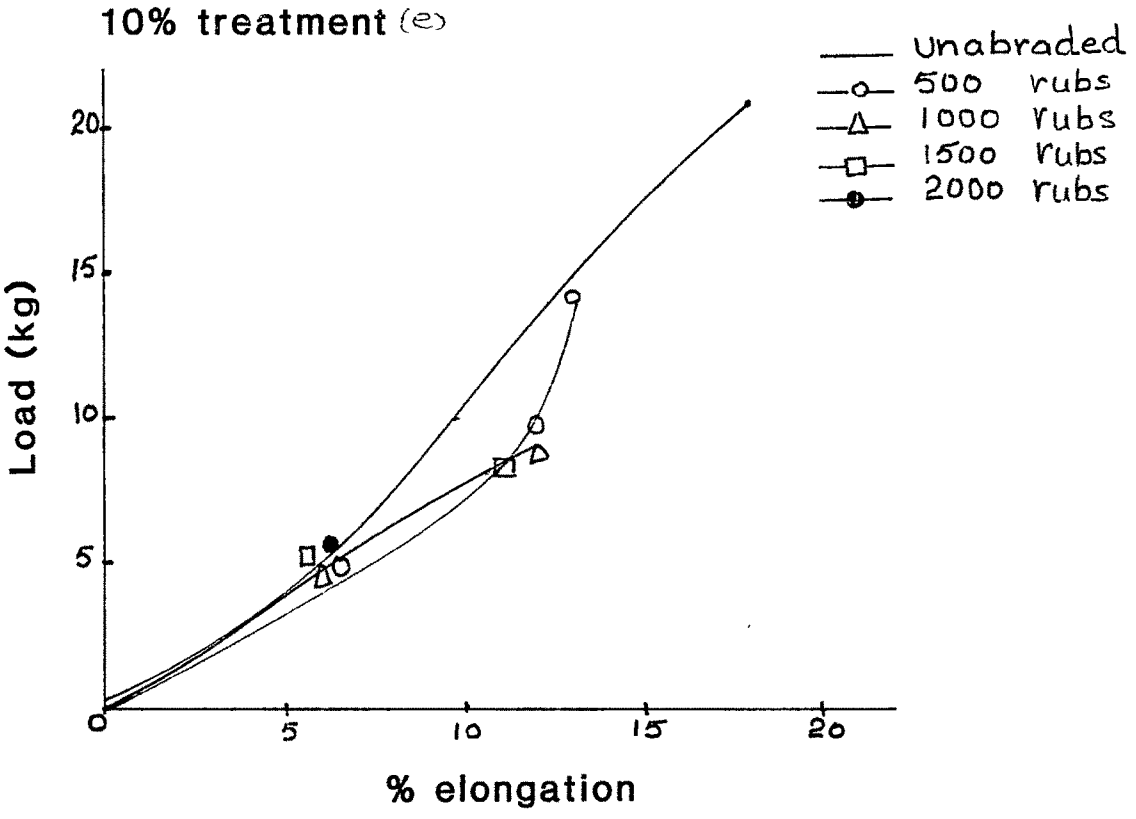
(Flat abrasion, Fabric C)





Effect of Acrylmide Finish on Load-elongation curve

(Flat abrasion Fabric C)



5.5.2 Influence of acrylamide finish on fabrics A, B and C after rotary abrasion.

a. Fabric A

As shown in Fig. 13 and Tables 11a and 11b acrylamide finish improved the resistance to rotary abrasion of fabric A. It was noted that untreated fabric had shown a little more strength loss as compared to treated fabrics at each level of rotary abrasion. Untreated fabric had shown 2 kg loss whereas treated fabric had shown 1.4 kg strength loss after 5 minutes of rotary abrasion. There was similar loss in strength after 10 minutes. After 15 minutes of abrasion, the strength loss for untreated fabric was 21 percent whereas for treated fabric it was 19.5 percent.

There was decrease in percent elongation of fabrics after the treatment with acrylamide finish. There was not much change noted in increase in elongation with increased abrasion but there was increase in elongation at break. Results are shown in Fig. 14 and Table 21.

b. Fabric B

As shown in Fig. 15 and Tables 11a and 11b fabric B also improved for its resistance towards rotary abrasion with acrylamide finish. Because untreated fabric B had shown 3 kg, 4 kg and 4.1 kg strength loss whereas treated fabric had shown 2 kg, 2.4 kg, 3.4 kg strength loss/..

loss after 5, 10 and 15 minutes of rotary abrasion.

Results on elongation are shown in Fig. 16 and Tables 22a and 22b. There was decrease in percent elongation after the treatment of finish but elongation increased with the increasing load.

c. Fabric C

As shown in Fig. 17 and Tables 11a and 11b, acrylamide finish on fabric C improved its resistance to rotary abrasion. As it had shown less strength loss, results were similar to fabric A. Strength loss for untreated fabric was 1 kg, 2 kg and 3 kg whereas strength loss for treated fabric was 0.2 kg, 2.5 kg and 3 kg after 5, 10 and 15 minutes respectively.

Percent elongation was decreased with acrylamide finish. There was not much of difference in increase in elongation with increased abrasion but elongation showed increase at increasing load. Results are shown in Fig. 18 and Table 23.

Table 10a: Tensile strength of treated fabric with 2.5% acrylamide finish, after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Time (Min)	Kg	Kg	Kg
0	18.0*	41.0*	20.0*
5	17.0	39.0	20.0
10	17.0	38.5	19.0
15	16.5	37.0	15.0

Table 10b: Tensile strength of treated fabric with 2.5% acrylamide finish, after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Time (Min)	%	%	%
0	100.0	100.0	100.0
5	94.44	95.12	100.0
10	94.44	93.90	95.0
15	83.33	90.94	75.0

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 11a: Tensile strength of fabric treated with 5 percent acrylamide finish after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Time (min)	Kg	Kg	Kg
0	19.0*	41.0*	22.0*
5	17.6	39.0	21.8
10	16.3	38.6	19.5
15	15.3	37.6	18.0

Table 11b: Tensile strength of fabric treated with 5 percent acrylamide finish after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Time (min)	%	%	%
0	100.0	100.0	100.0
5	92.63	97.50	96.81
10	85.28	96.50	88.63
15	80.52	94.16	81.81

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 12a: Tensile strength of fabrics treated with 7.5% acrylamide finish after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Time (min	Kg	Kg	Kg
0	18.0*	40.0*	21.5*
5	17.5	39.0	21.0
10	17.0	39.0	20.0
15	17.0	38.0	18.0

Table 12b: Tensile strength of fabrics treated with 7.5% acrylamide finish after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Time (min)	%	%	%
0	100.0	100.0	100.0
5	97.22	97.5	97.67
10	94.44	97.5	93.02
15	94.44	95.0	83.72

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 13a: Tensile strength of fabric treated with 10% acrylamide finish after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Time (min)	Kg	Kg	Kg
0	18.0*	41.0*	22.0*
5	18.0	41.0	21.0
10	18.0	40.0	20.5
15	17.0	39.66	20.0

Table 13b: Tensile strength of fabric treated with 10% acrylamide finish after rotary abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Time (min)	%	%	%
0	100.0	100.0	100.0
5	100.0	100.0	95.45
10	100.0	97.56	93.18
15	94.4	96.73	90.90

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Effect of varying concentrations of Acrylamide finish

on tensile strength (Rotary abrasion, Fabric A)

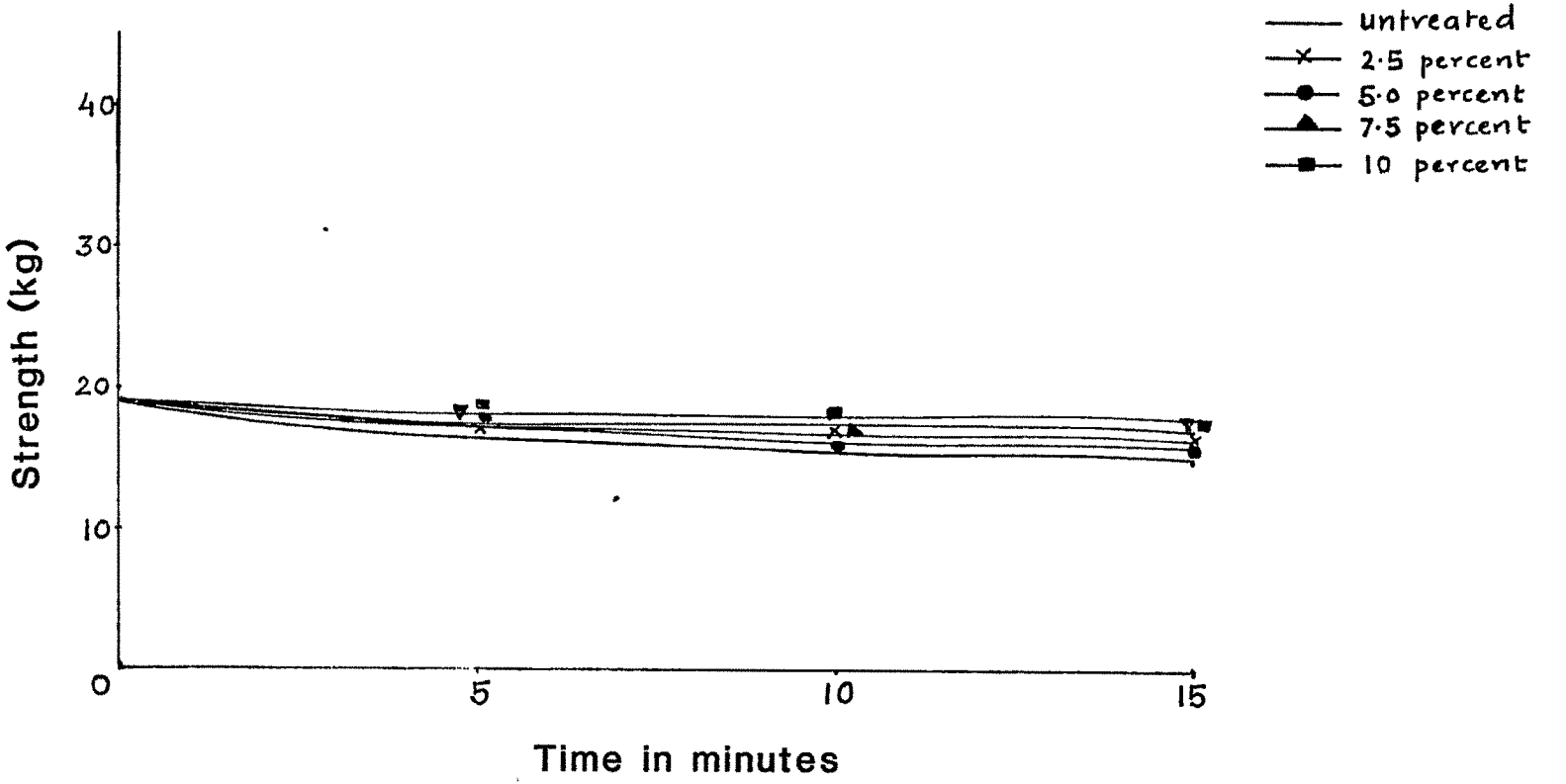
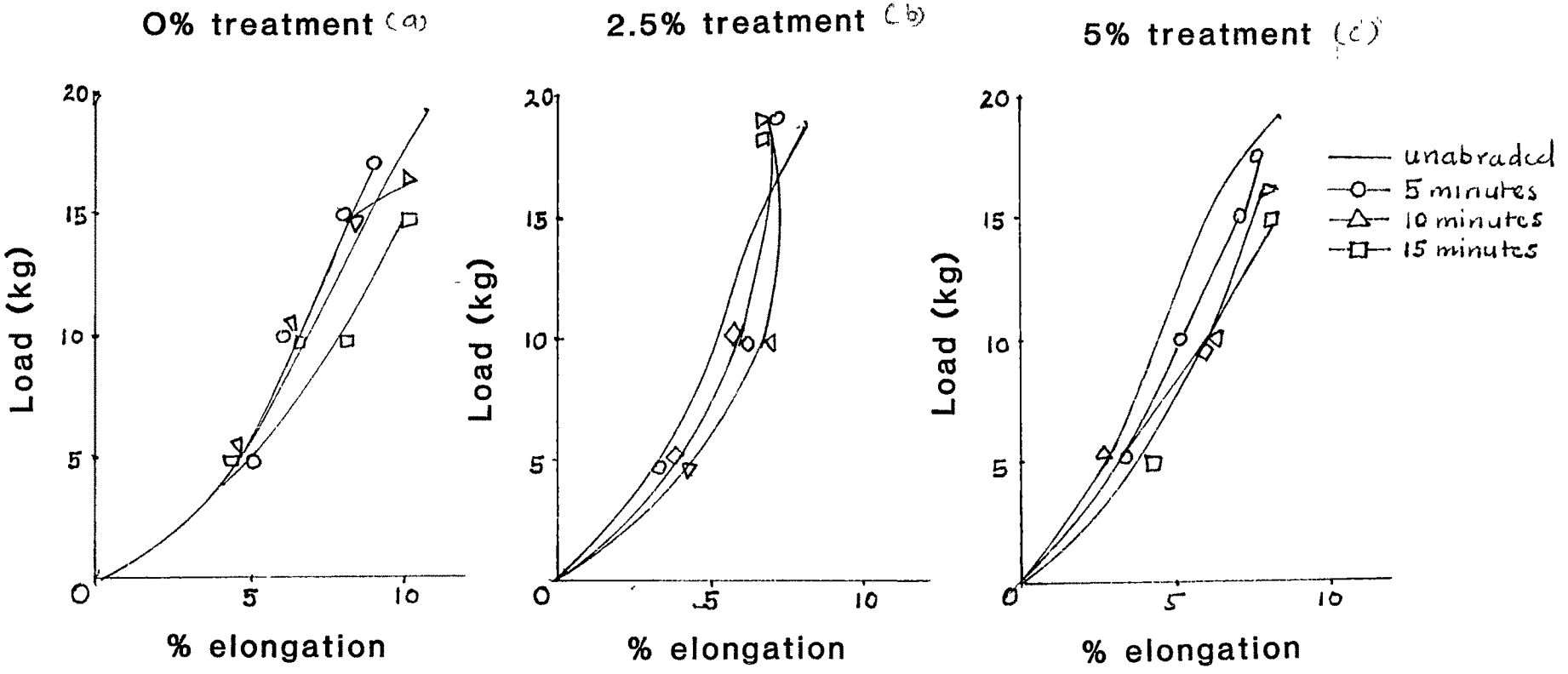


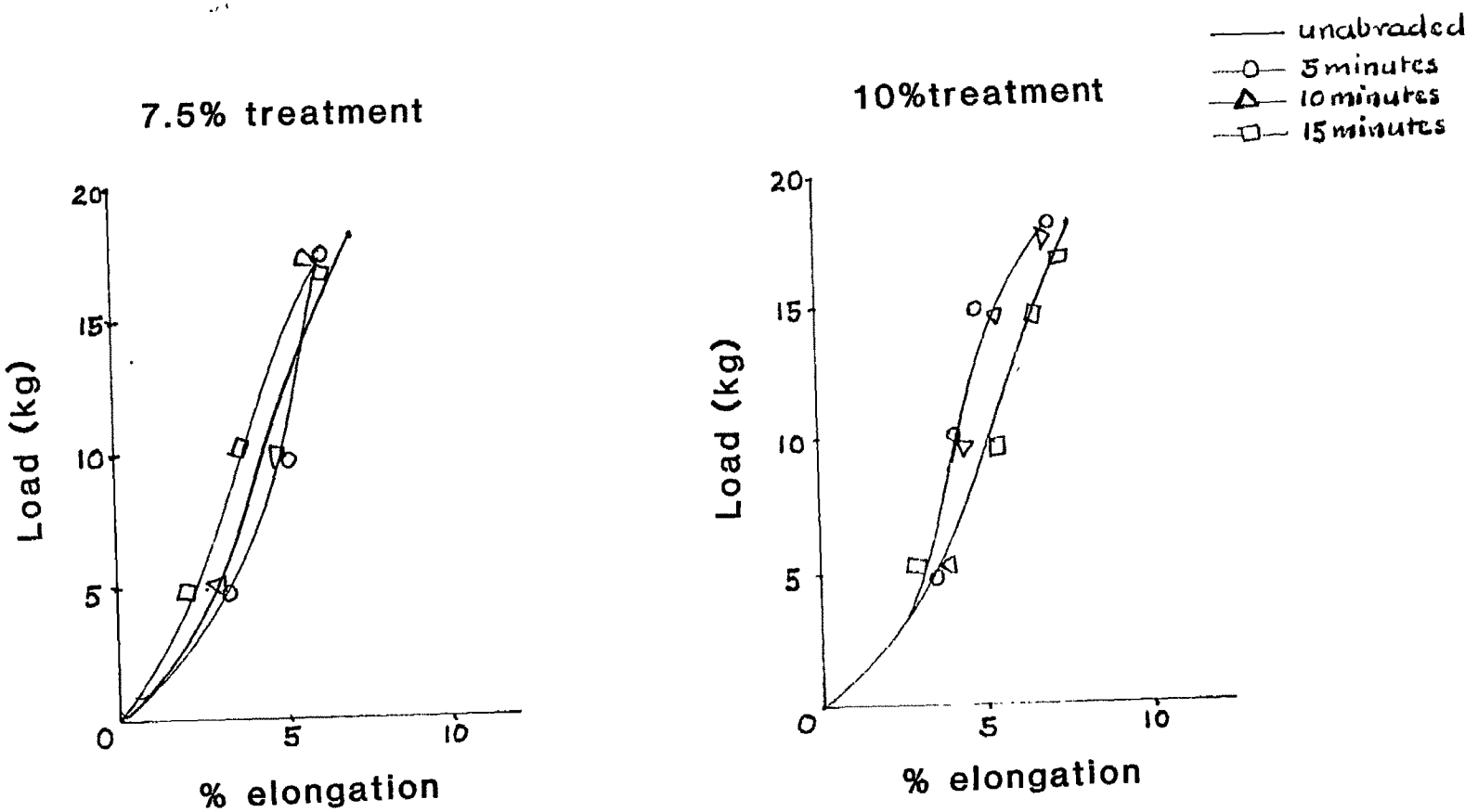
Fig13

Effect of Acrylamide finish on Load-elongation curve (Rotary abrasion, Fabric A)

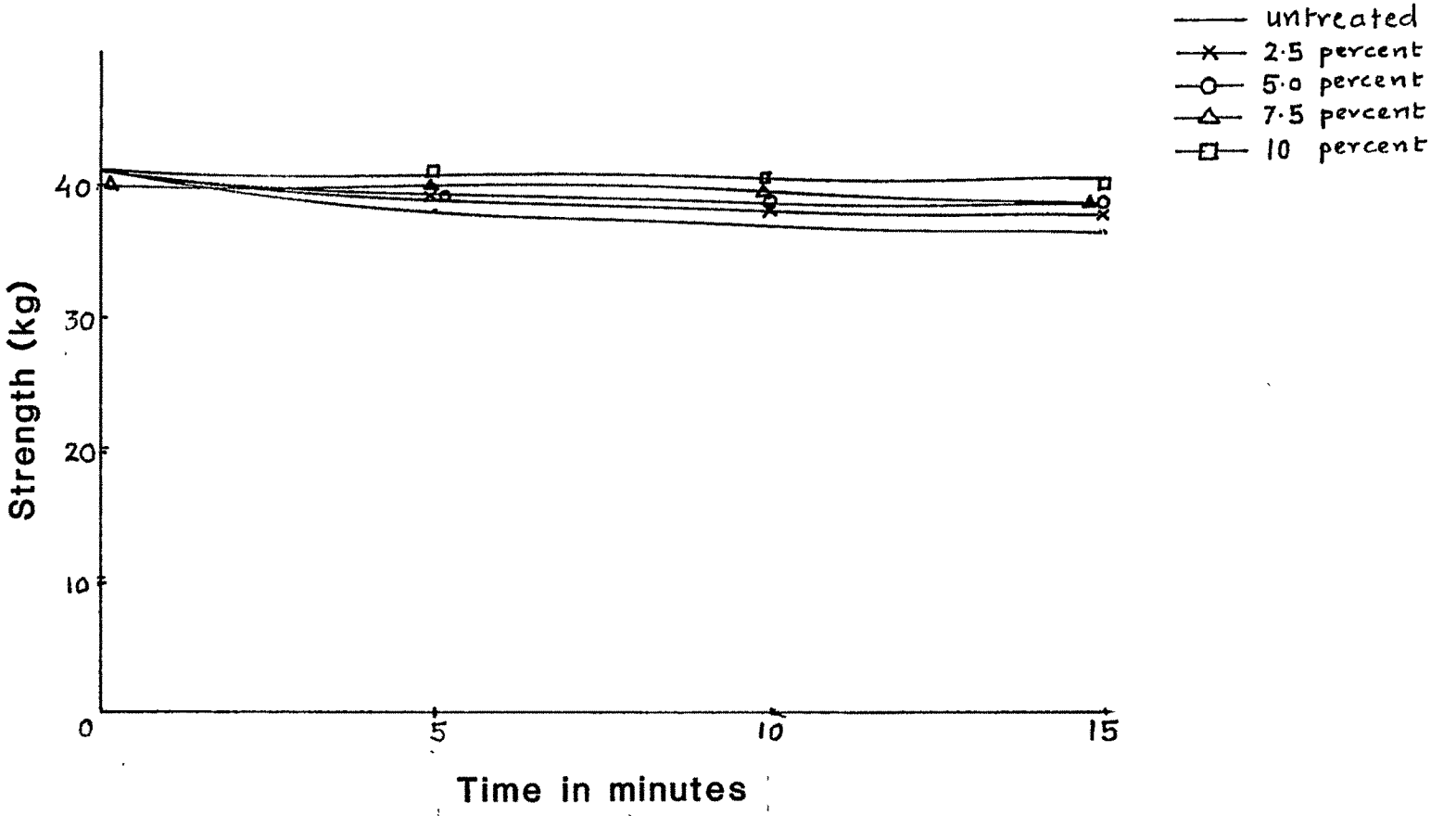
Fig 14



Effect of Acrylamide finish on Load-elongation curve (Rotary abrasion,Fabric A)



Effect of varying concentrations of Acrylamide finish on tensile strength (Rotary abrasion, Fabric B)

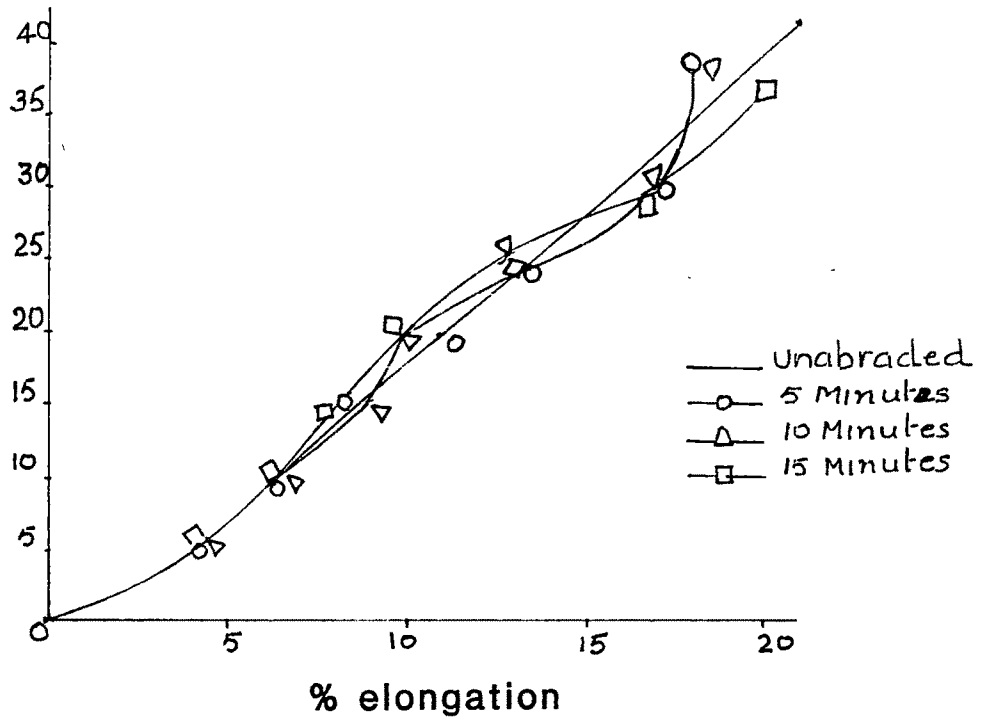


FigI5

Effect of Acrylamide finish on Load-elongation curve

(Rotary abrasion,Fabric B)

0% treatment (a)



2.5% treatment (b)

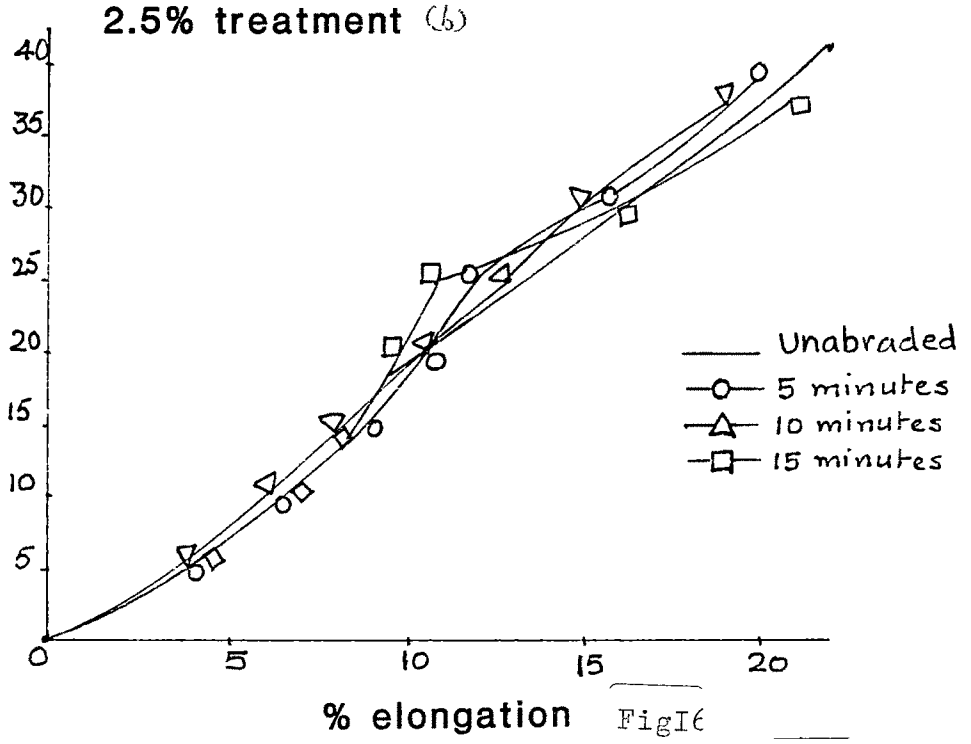
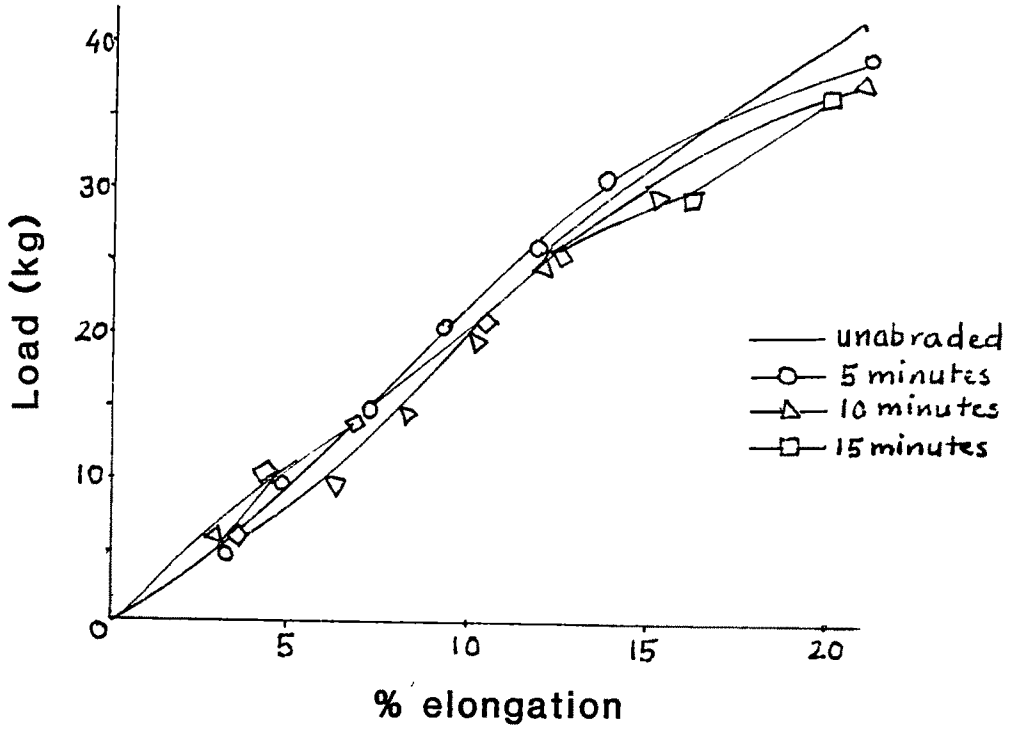


Fig I(

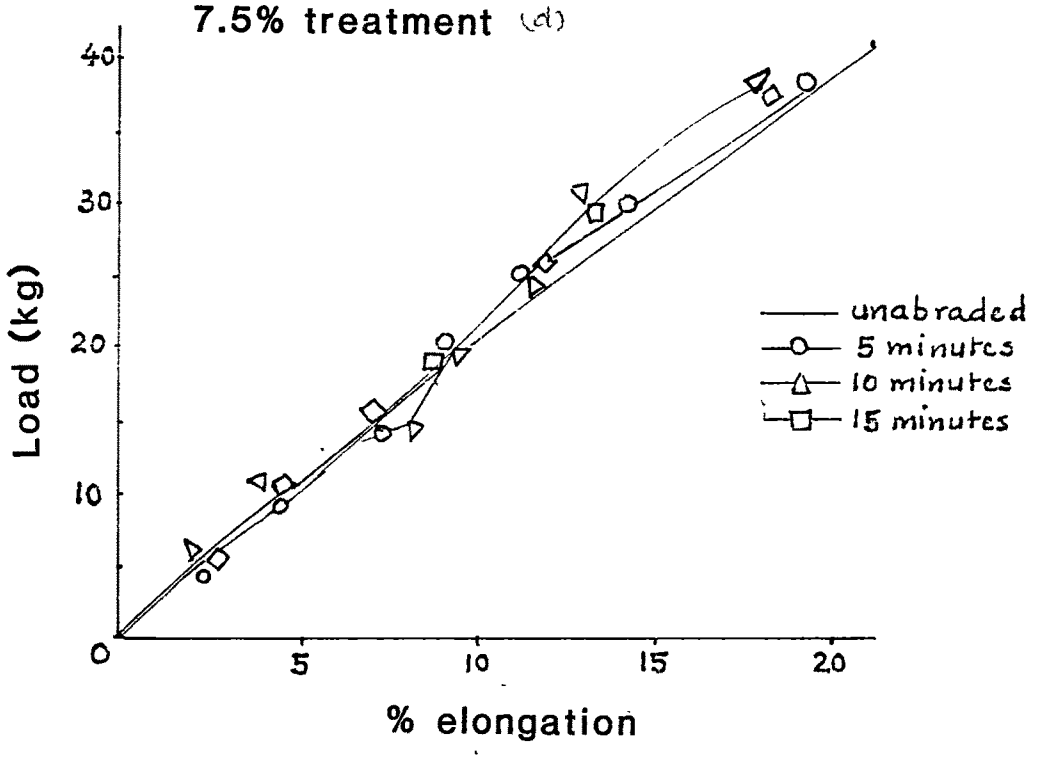
Effect of Acrylamide Finish on Load-elongation curve

(Rotary abrasion, Fabric B)

5% treatment (c)

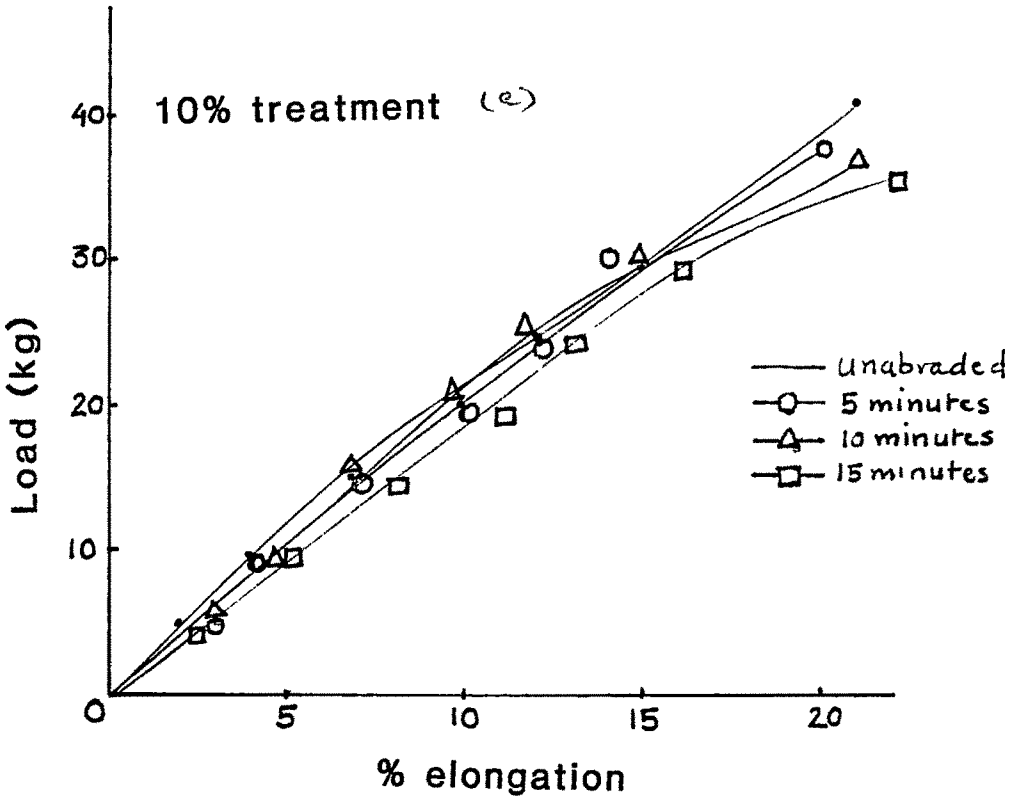


7.5% treatment (d)



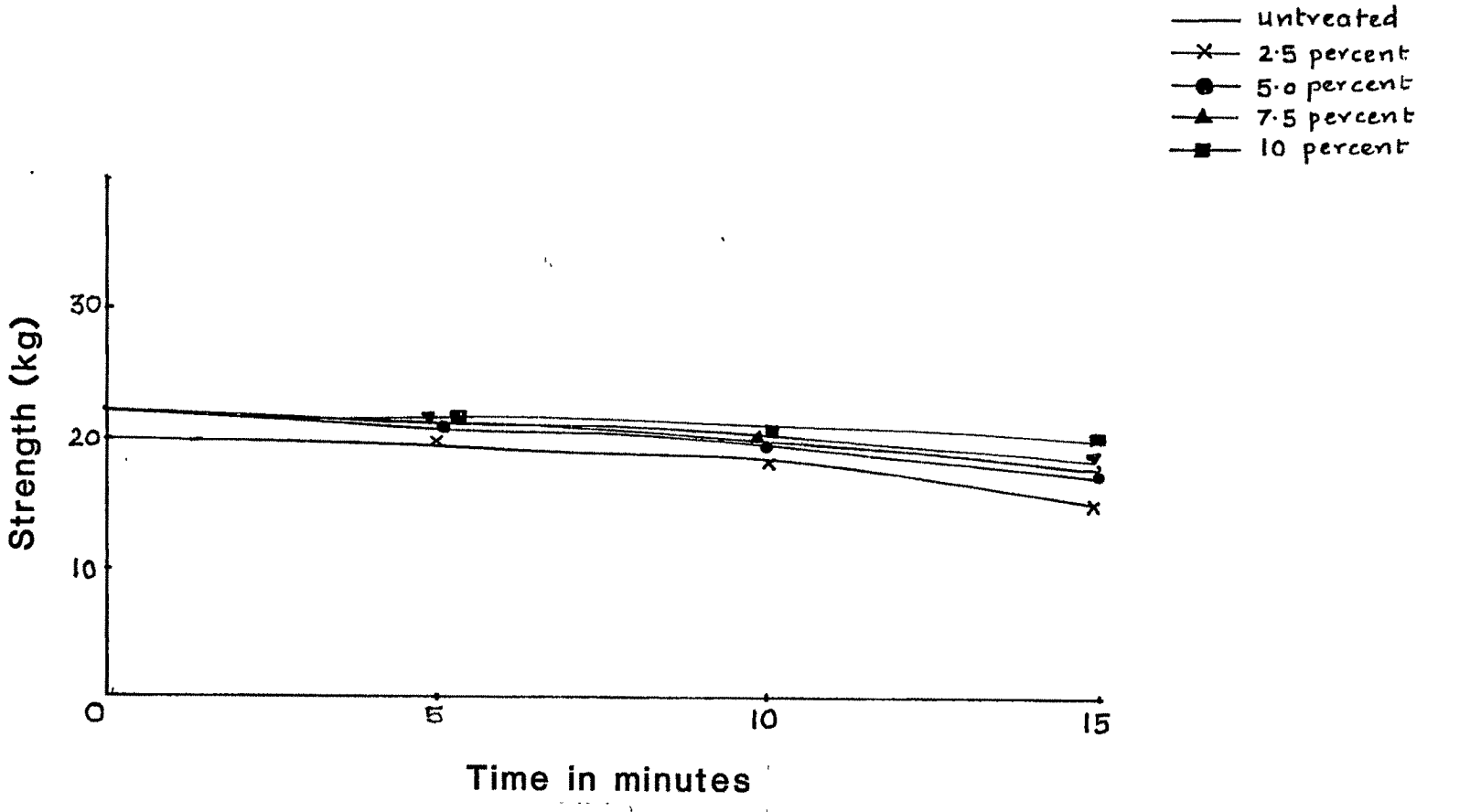
Effect of Acrylamide Finish on Load-elongation curve

(Rotary abrasion,Fabric B)



Effect of varying concentrations of Acrylamide finish

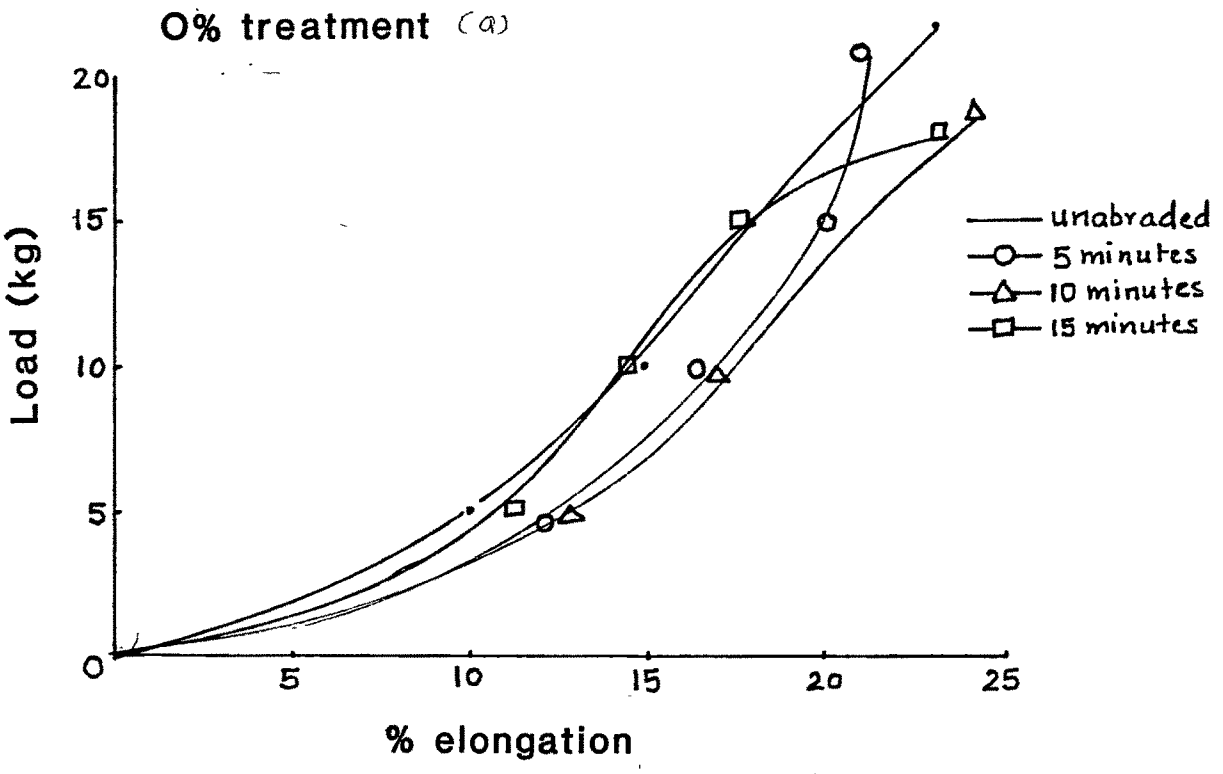
on tensile strength (Rotary abrasion, Fabric C)

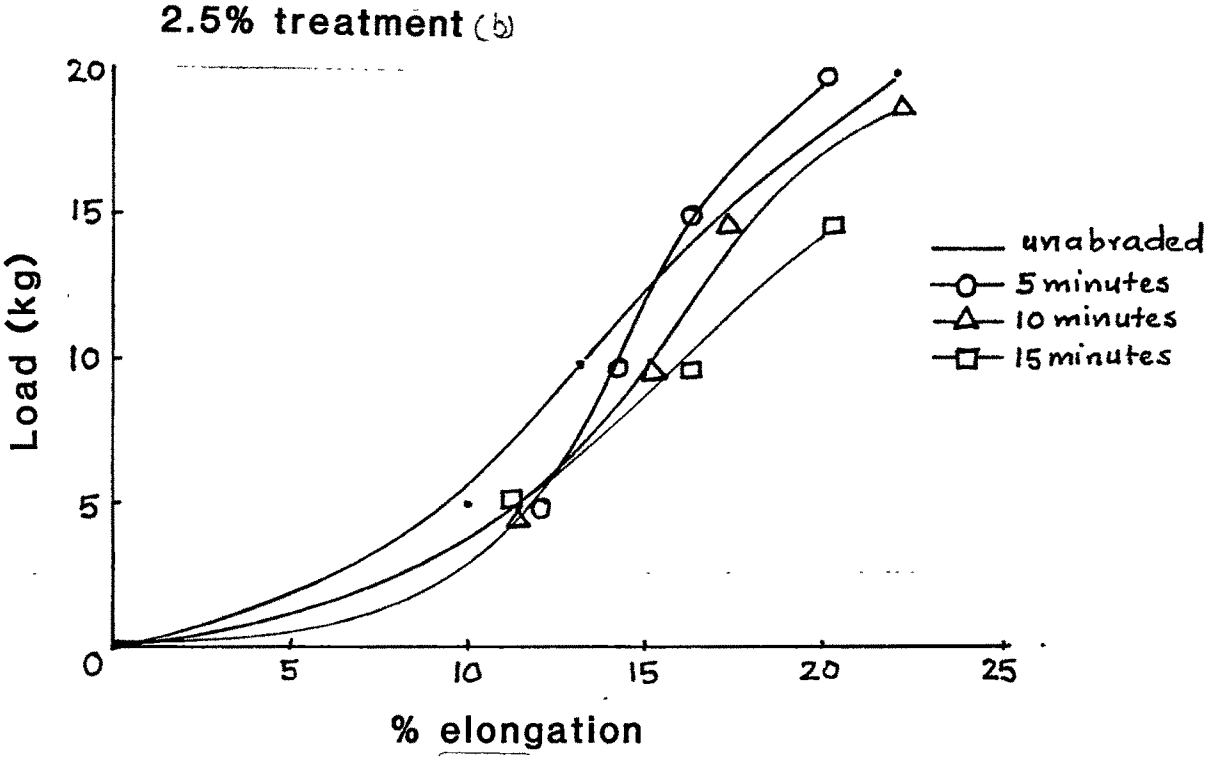


FigI7

Effect of Acrylamide finish on Load-elongation curve

(Rotary abrasion, Fabric C)

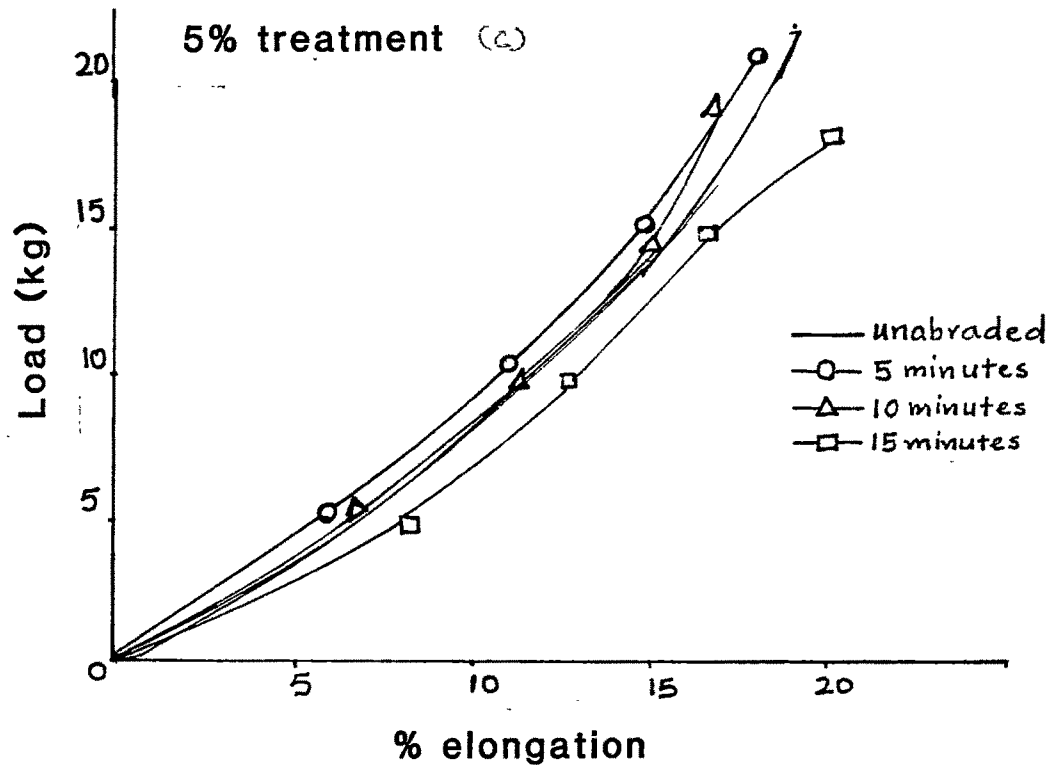


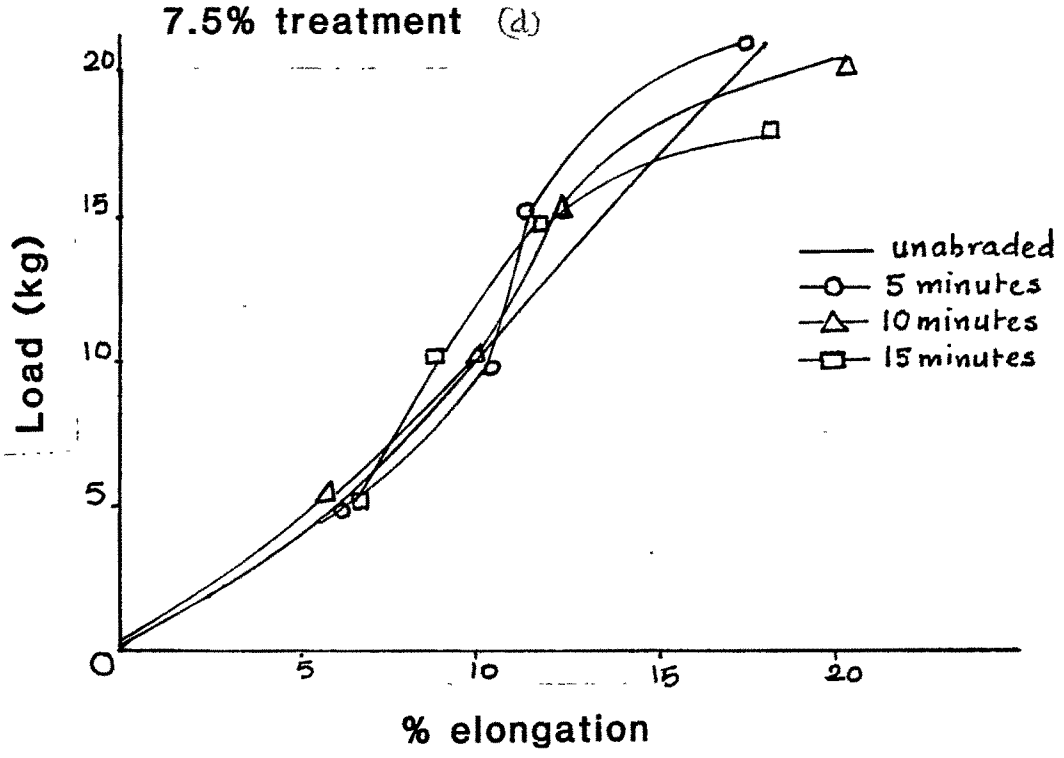


FigI8

Effect of Acrylamide Finish on Load-elongation curve

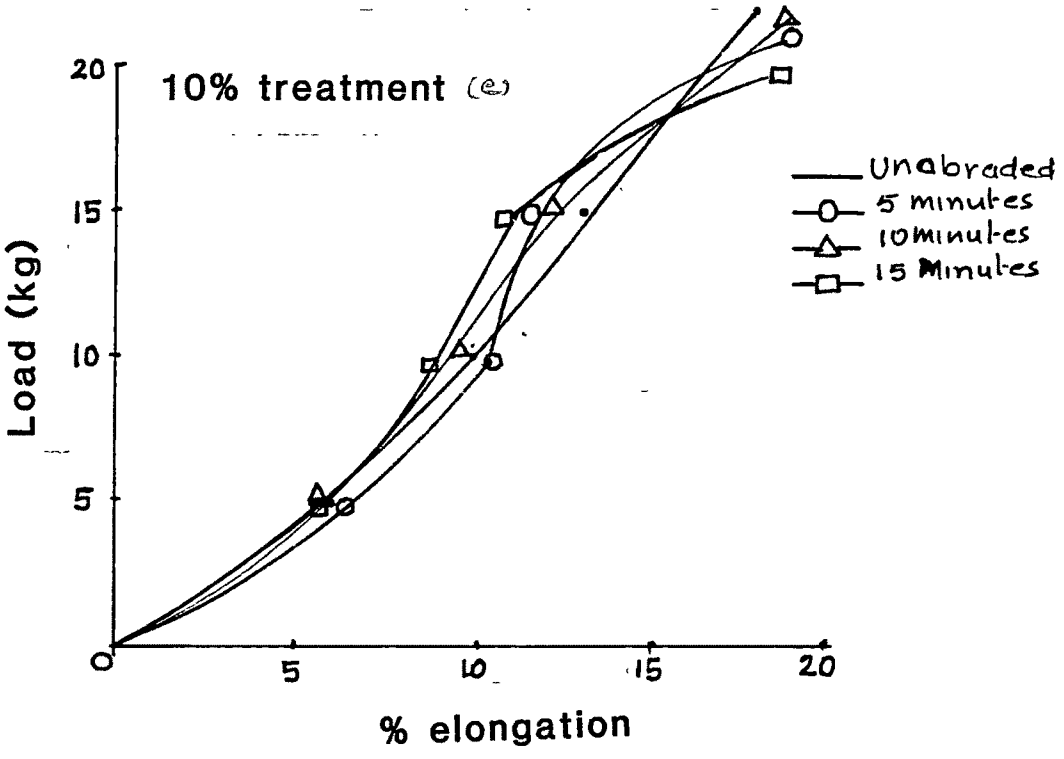
(Rotary abrasion, Fabric C





Effect of Acrylamide Finish on Load-elongation curve

(Rotary abrasion Fabric C)



5.5.3 Influence of Acrylamide finish on fabrics A, B and C after impact abrasion.

a. Fabric A

As shown in Fig. 19 and Tables 15a and 15b it was found that acrylamide finish improved the impact abrasion resistance of fabric A. Strength loss of untreated fabric was 3.4 kg, 4.9 kg, 6.0 kg, 6.0 kg and 6.8 kg whereas for treated fabric it was 1 kg, 2 kg, 2.5 kg, 2.7 kg, 4.0 kg and 4.0 kg after 25, 50, 100, 200, 500 and 1000 impacts respectively.

Percent elongation was decreased after acrylamide treatment. Elongation had no effect on increasing abrasion. Results are shown in Fig. 20 and Table 21.

b. Fabric B

As shown in Fig. 21 and Tables 15a and 15b it was found that acrylamide finish had improved impact abrasion resistance of fabric B. It was noted that untreated fabric had shown 3.0 kg, 3.4 kg, 3.4 kg, 4.4 kg, 5.0 kg and 5.4 kg strength loss whereas treated fabric had shown 1.0 kg, 2.0 kg, 3.0 kg, 4.0 kg, 4.5 kg, 5.0 kg and 4.0 kg strength loss after 25, 50, 100, 200, 500 and 1000 impacts respectively.

There was decrease in elongation after treatment of acrylamide finish but it increased along with increasing load. Results are shown in Fig. 22 and Tables 22a and 22b.

c. Fabric C/..

c. Fabric C

As shown in the Fig. 23 and Tables 15a and 15b it was found that resistance to impact abrasion was also improved for fabric C as the treated fabric showed less strength loss as compared to untreated fabric. The strength loss for untreated fabric was 2.0 kg, 2.8 kg, 3.1 kg, 3.7 kg, 5.2 kg and 5.7 kg after 25, 50, 100, 200, 500 and 1000 impacts. Whereas treated fabric C showed 1 kg loss up to 50 impacts and then 2kg up to 200 impacts and 4.4 kg to 5.5 kg up to 1000 impacts.

Percent elongation decreased for fabric C also after the acrylamide treatment elongation increased along with increasing load, not with increased abrasion. Fig. 24 and Table 23 show the results in elongation determination.

Table 14a: Tensile strength of treated fabrics with 2.5% acrylamide finish after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Impact	Kg	Kg	Kg
0	18.0*	41.0*	20.0*
25	16.5	38.0	20.0
50	15.0	38.0	20.0
100	15.0	38.0	19.5
200	14.5	37.0	18.0
500	14.5	36.0	18.0
1000	13.5	36.0	15.0

Table 14b: Tensile strength of treated fabrics with 2.5% acrylamide finish after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Impact	%	%	%
0	100.0	100.0	100.0
25	91.66	92.68	100.0
50	83.33	92.68	100.0
100	83.33	92.68	100.0
200	80.55	90.24	90.0
500	80.55	87.80	90.0
1000	75.00	87.80	75.0

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - original strength, 100% (Fabric C)

Table 15a: Tensile strength of fabric treated with 5 percent acrylamide finish, after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Impacts	Kg	Kg	Kg
0	19.0*	40.0*	22.0*
25	18.0	39.0	21.0
50	17.0	38.0	21.0
100	16.5	37.0	20.0
200	16.3	36.0	19.5
500	15.0	35.5	17.6
1000	15.0	35.0	16.5

Table 15b: Tensile strength of fabric treated with 5 percent acrylamide finish, after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Impacts	%	%	%
0	100.0	100.0	100.0
25	94.74	97.50	95.45
50	89.47	95.00	95.45
100	86.84	92.50	90.90
200	85.78	90.00	88.63
500	78.74	88.75	80.00
1000	78.74	87.50	75.00

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 16a: Tensile strength of fabrics treated with 7.5% acrylamide after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Impact	Kg	Kg	Kg
0	18.0*	40.0*	21.6*
25	18.0	40.0	20.0
50	18.0	39.0	20.0
100	18.0	38.5	20.0
200	17.5	37.33	18.33
500	17.5	36.33	17.00
1000	16.5	36.00	17.00

Table 16b: Tensile strength of fabrics treated with 7.5% acrylamide after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Impact	%	%	%
0	100.0	100.0	100.0
25	100.0	100.0	95.23
50	100.0	97.50	95.23
100	100.0	96.25	95.23
200	97.22	93.32	87.25
500	97.22	90.82	80.00
1000	91.66	90.00	80.00

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Table 17a: Tensile strength of fabric treated with 10% acrylamide after impact abrasion.

Fabric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength kg/2.5cm Impact	Kg	Kg	Kg
0	18.0*	41.0*	22.0*
25	18.0	41.0	22.0
50	18.0	40.5	21.0
100	18.0	39.0	20.5
200	17.5	39.0	20.0
500	17.12	38.5	20.0
1000	16.00	38.0	19.5

Table 17b: Tensile strength of fabric treated with 10% acrylamide after impact abrasion.

Faric code	Cotton (A)	Polyester/Cotton (B)	Cotton/Polyester (C)
Strength (%) Impact	%	%	%
0	100.0	100.0	100.0
25	100.0	100.0	100.0
50	100.0	98.78	95.45
100	100.0	95.12	93.18
200	95.11	95.12	90.90
500	94.00	93.90	90.90
1000	83.33	92.63	88.63

Note: 18kg - Original strength, 100% (Fabric A)
41kg - Original strength, 100% (Fabric B)
20kg - Original strength, 100% (Fabric C)

Effect of varying concentrations of Acrylamide finish on tensile strength (Impact abrasion, Fabric A)

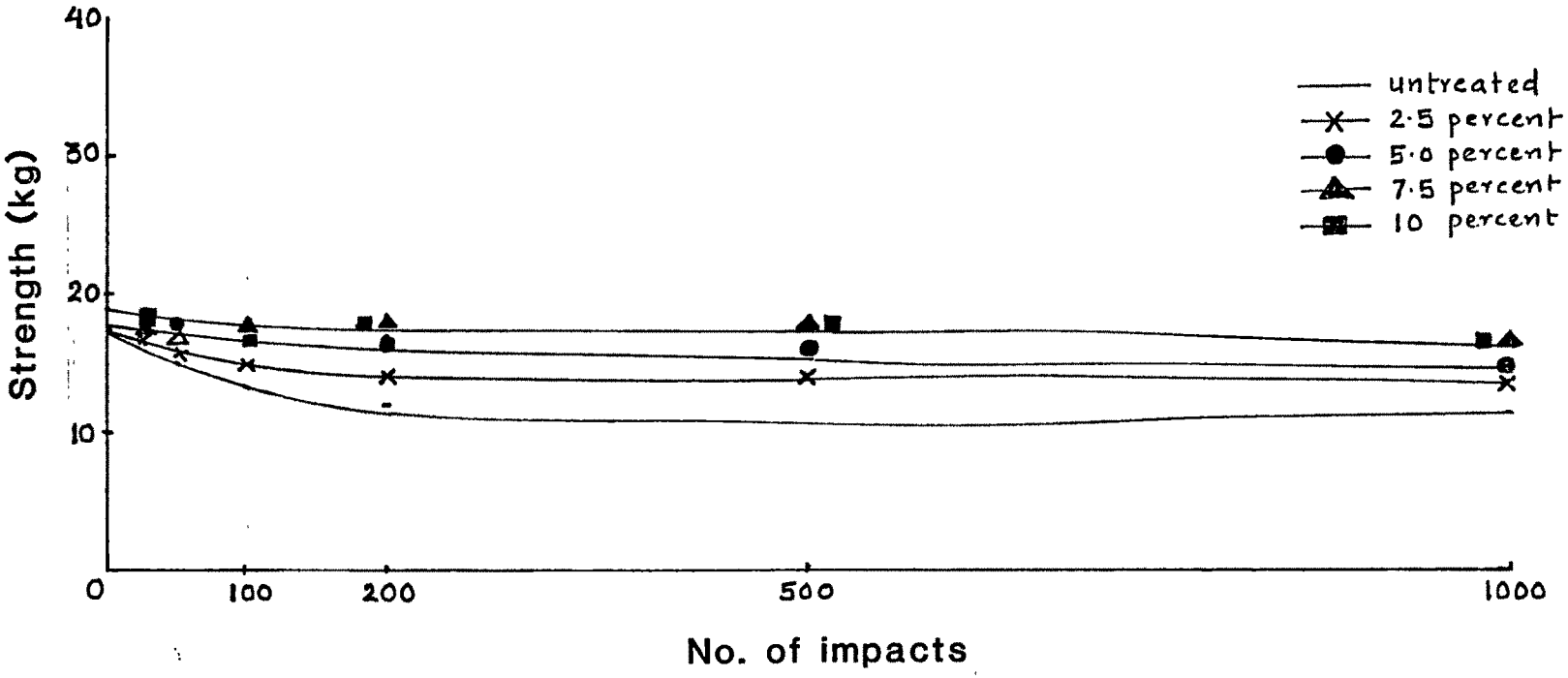
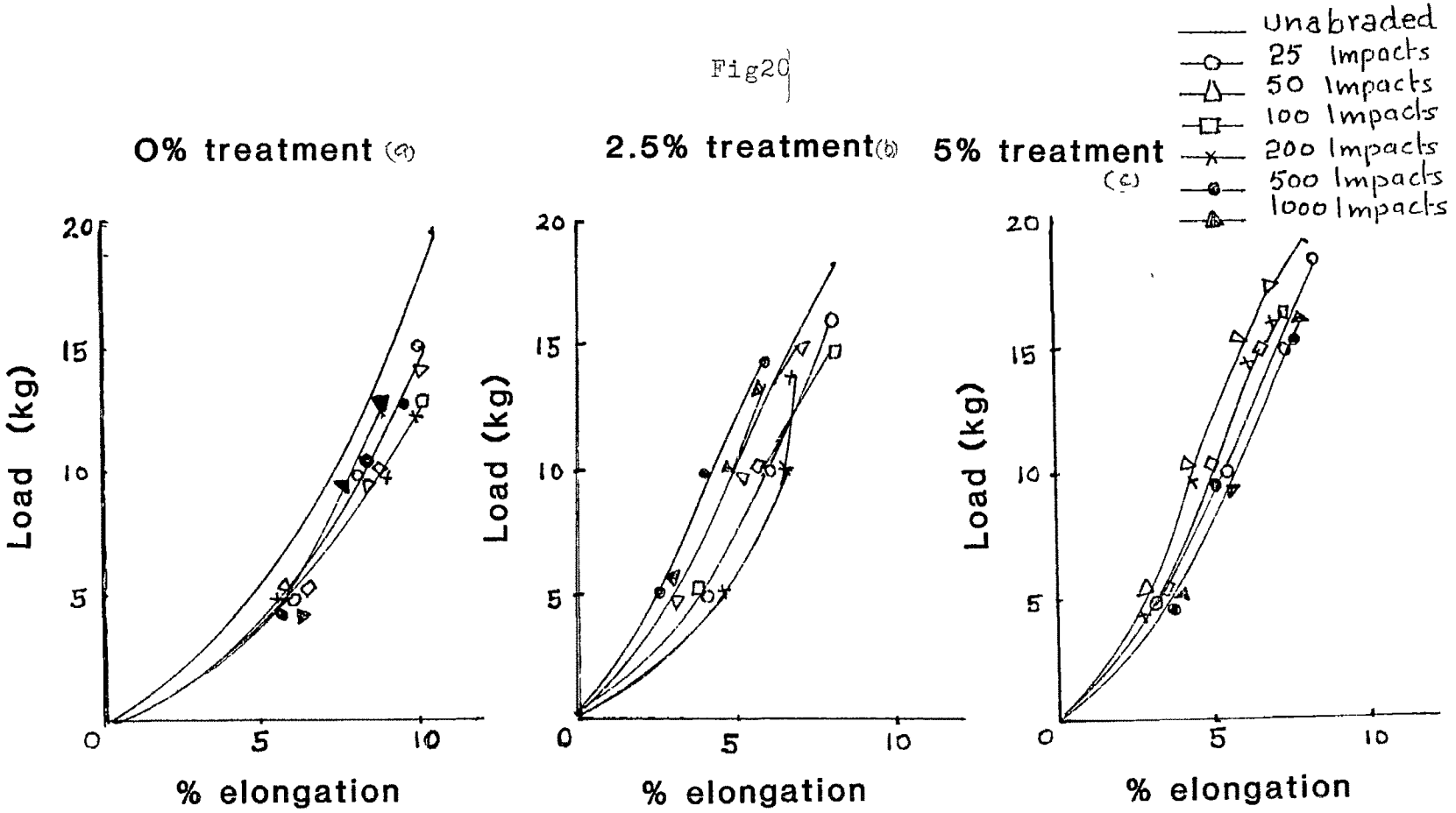


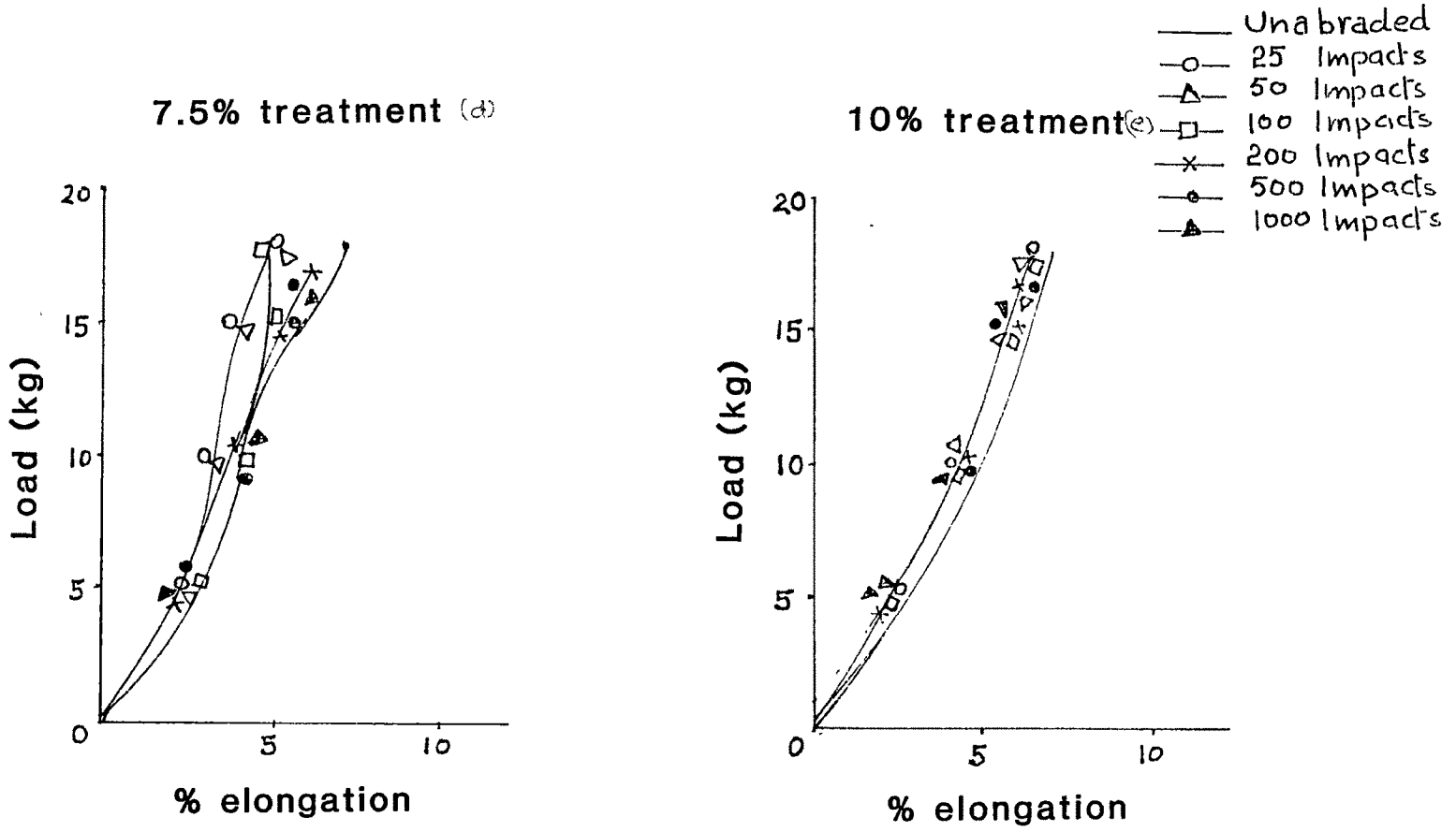
Fig19

Effect of Acrylamide finish on Load-elongation curve (Impact abrasion, Fabric A)

Fig20



Effect of Acrylamide Finish on Load-elongation curve (Impact, abrasion, Fabric A)



Effect of varying concentrations of Acrylamide finish

on tensile strength (Impact abrasion, Fabric B)

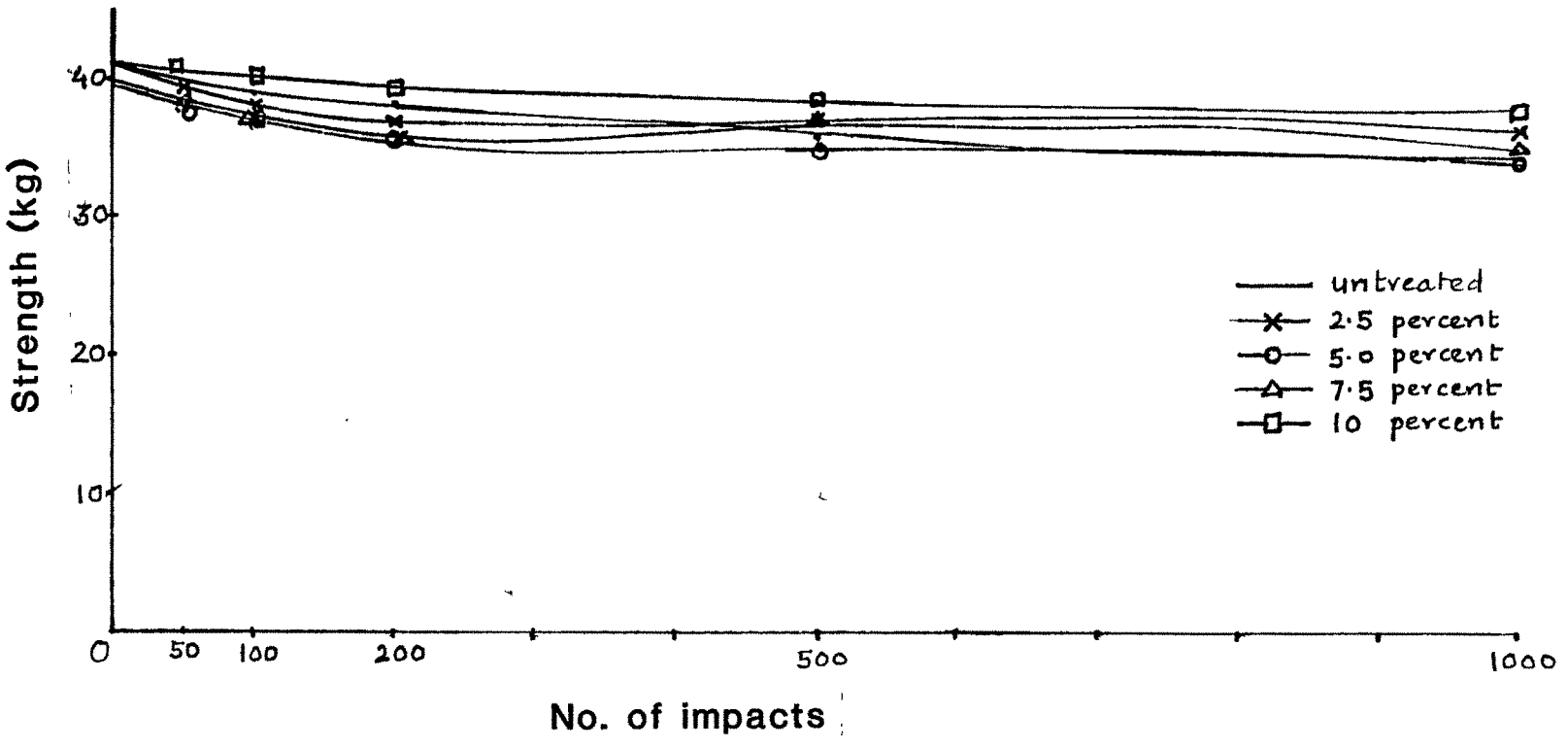


Fig21

Effect of Acrylamide finish on Load-elongation curve

(Impact abrasion, Fabric B)

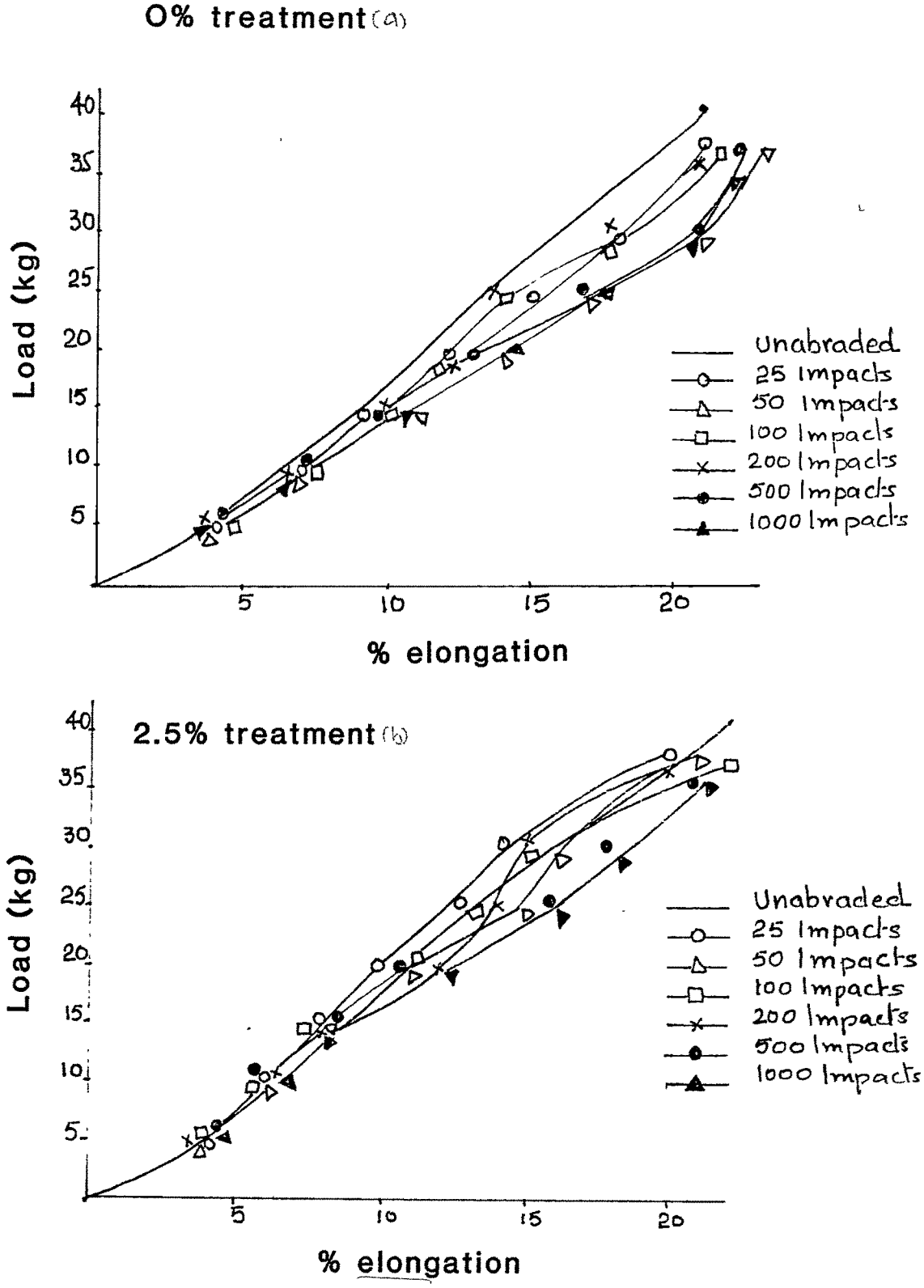
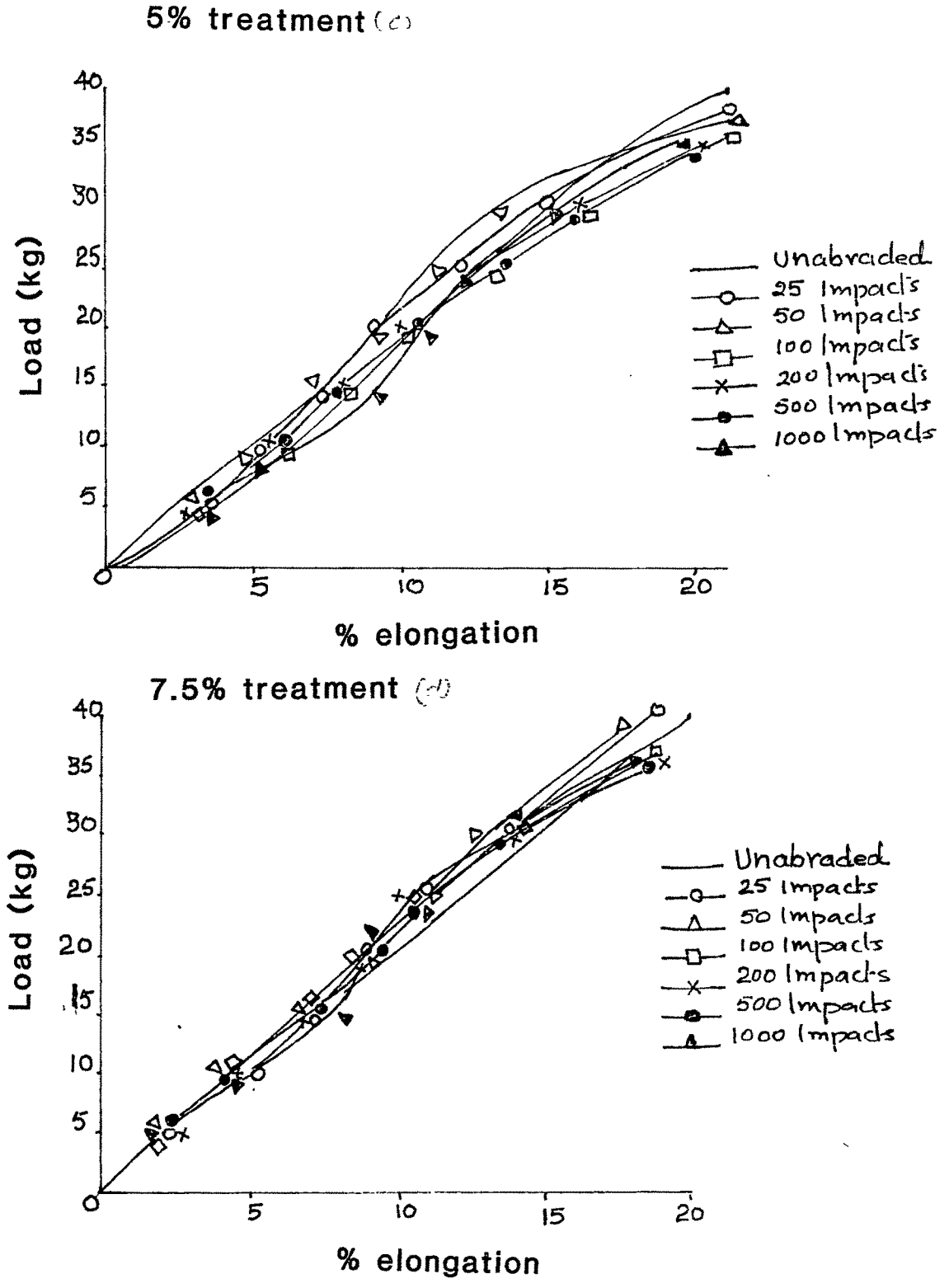


Fig22

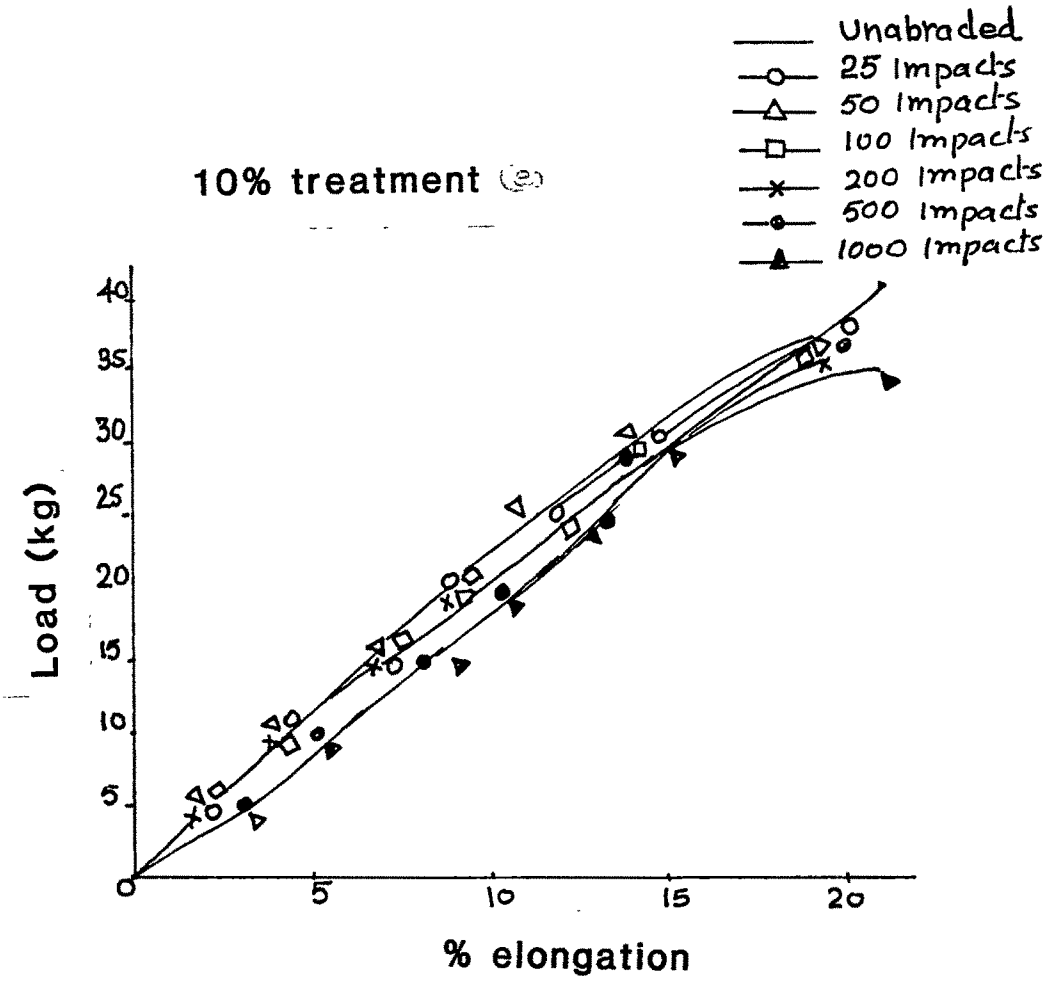
Effect of Acrylamide Finish on Load-elongation curve

(Impact abrasion,FabricB)



Effect of Acrylamide Finish on Load-elongation curve

(Impact abrasion Fabric B)



Effect of varying concentrations of Acrylamide finish

on tensile strength of (Impact abrasion, Fabric C)

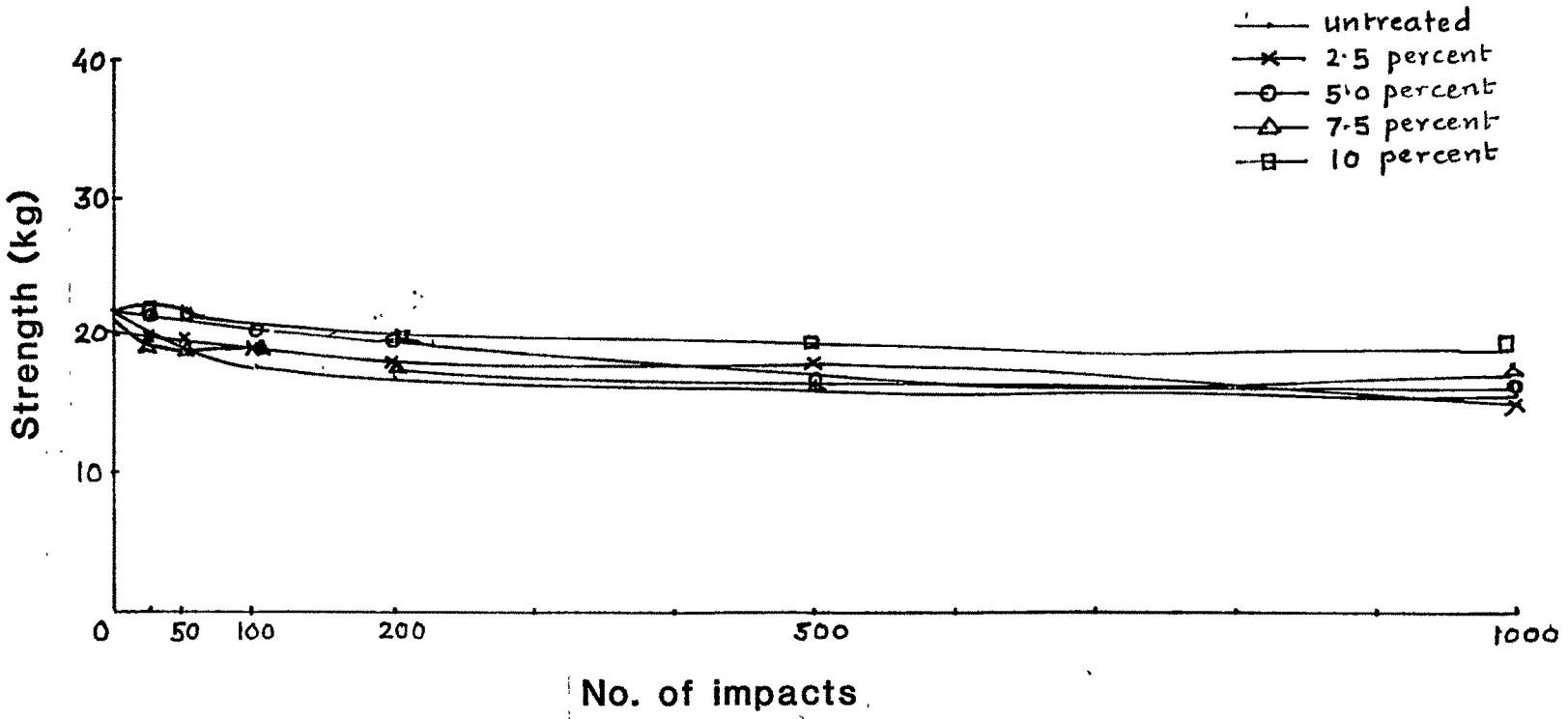
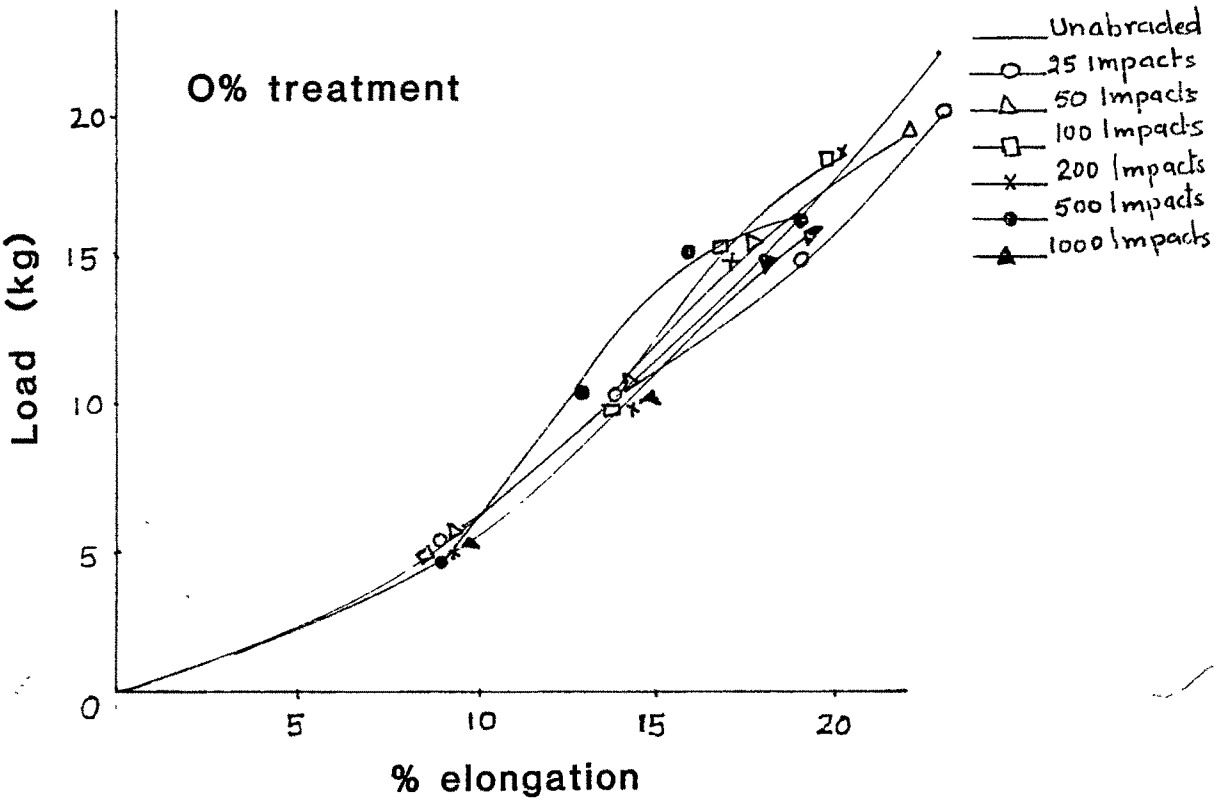


Fig23

Effect of Acrylamide finish on Load-elongation curve

(Impact abrasion, Fabric C)



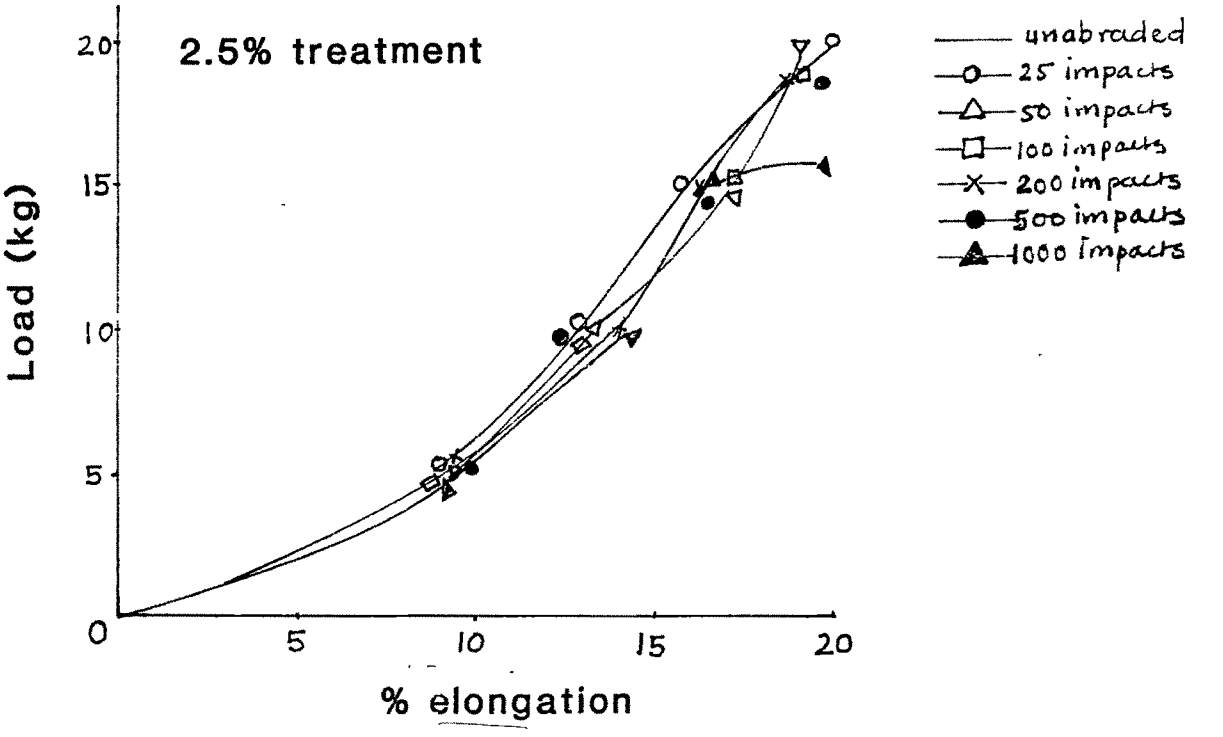
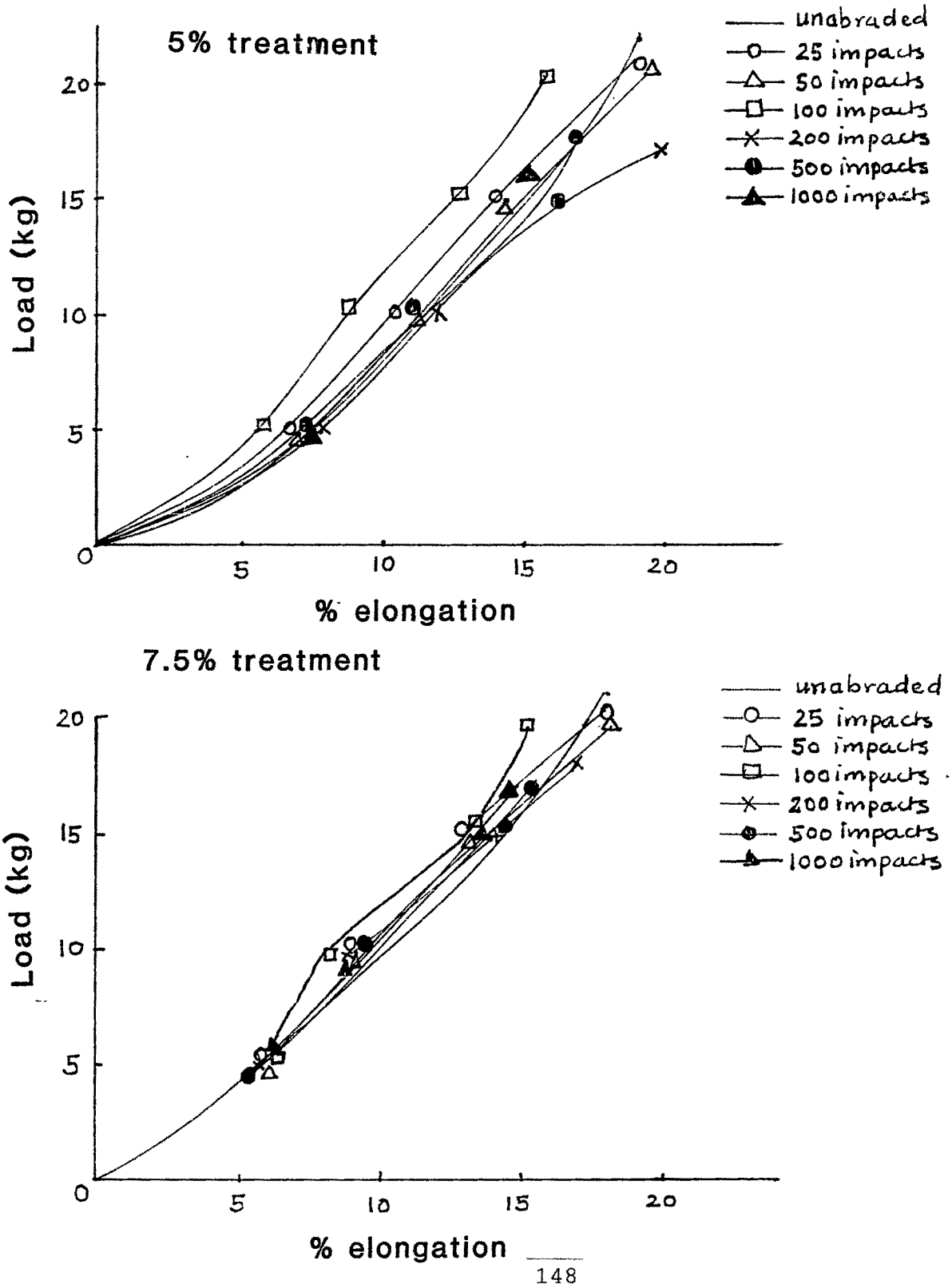


Fig24

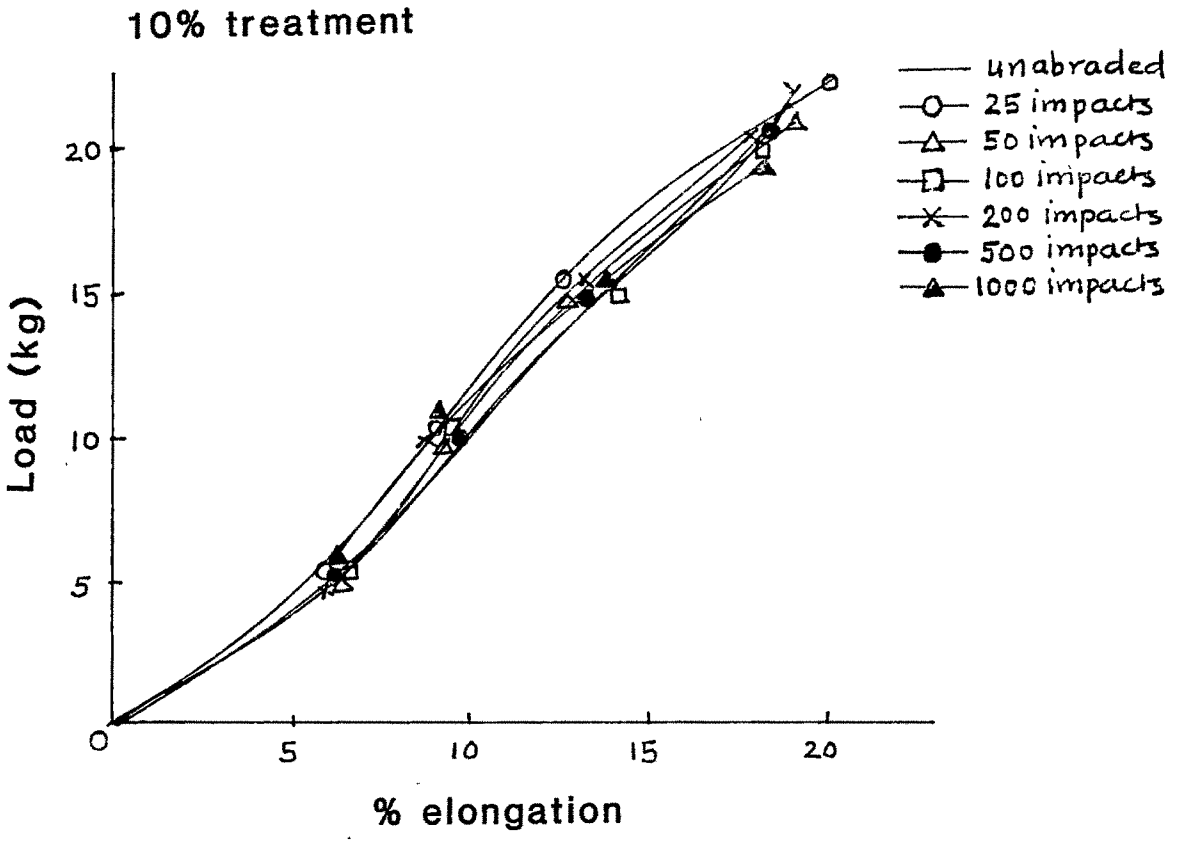
Effect of Acrylamide Finish on Load-elongation curve

(Impact abrasion,Fabric C)



Effect of Acrylamide Finish on Load-elongation curve

(Impact abrasion Fabric C)



5.5.4 Influence of acrylamide finish on dry-wet impact abrasion.

a. Fabric A

Results on the effect of acrylamide finish and dry-wet impact abrasion on fabric A are shown in Fig. 4 and Tables 18a and 18b. It was found that acrylamide finish had protected fabrics because fabric A treated with acrylamide finish had shown less strength loss after dry impact abrasion. There was loss of 0.60 kg strength after 50 impacts, then 0.60 kg, 0.83 kg, 1.29 kg. and 2 kg strength loss after 100, 200, 500 and 1000 impacts for treated fabrics and for untreated fabrics the strength loss was 0.51 kg, 1.63 kg, 1.97 kg, 2.54 kg and 3.0 kg after 50, 100, 200, 500 and 1000 dry impacts.

Percent elongation decreased after the treatment of acrylamide finish. Elongation did not increase with the increased abrasion.

Treated fabric A had shown little increase in strength loss after wet abrasion as compared with untreated fabric. Because there was 0.59 kg, 1.95 kg, 1.70 kg, 2.55 kg and 2.95 kg strength loss after 50, 100, 200, 500 and 1000 wet impacts. Whereas untreated fabric had shown 0.54 kg, 1.27 kg, 1.27 kg, 2.74 kg and 3.0 kg strength loss after each level as mentioned above.

There was not much difference in change of elongation in dry or wet abrasion. Elongation increased as the load increased.

b. Fabric B

As shown in Fig. 5 and Tables 19a and 19b, it was found that acrylamide finish had improved resistance of fabric B to dry impact abrasion as well as wet impact abrasion. Treated fabric showed 1 kg strength loss up to 100 impacts, 1.82 kg, 3.64 kg, 5.50 kg strength loss after 200, 500 and 1000 dry impacts. Whereas the untreated fabric had shown higher strength loss, in a similar pattern.

Results of wet impact abrasion are given in Table 19a and 19b and plotted on Fig. 5. Treated fabric showed similar strength loss in both the dry and wet impact abrasion.

There was no difference in elongation after dry and wet impact abrasion in both the treated as well as untreated fabric.

c. Fabric C

As shown in Fig. 6 and Tables 20a and 20b it was found that acrylamide finish had improved resistance of fabric C to dry and wet impact abrasion. Because untreated fabric after dry impact abrasion had shown 1.31 kg, 2.73 kg, 3.41 kg, 3.27 kg and 3.50 kg strength loss, whereas treated fabric had shown 0.60 kg, 1.19 kg, 1.19 kg, 2.42 kg and 4.10 kg strength loss. In the case of wetabrasion similar results were obtained for untreated/..

untreated fabric. Treated fabric had shown little increase in strength loss. This was due to the swollen state of the fibres in wet condition which caused more abrasion. Soni (67) also stated that wet abrasion caused severe damage to cotton fabrics and decreased the tensile strength of fabrics. Shah (63) and Parkhani (56) also reported that tensile strength decreased with increased wet abrasion.

Chaudhry (13) reported that tensile strength decreased after treatment with acrylic finish of polyester fabric. It was also noted in the present study. Jain (40) in her work found that tensile strength of cotton fabric was reduced with lower concentration but was maintained with higher concentration.

Table 18a: Tensile strength of treated cotton (Fabric A) after dry and wet impact abrasion.

Strength (kg/2.5cm)	Dry		Wet	
No. of Impacts	Untreated Kg	Treated (5%) Kg	Untreated Kg	Treated(5%) Kg
0	15.6	15.6	15.90	15.45
50	14.09	15.9	14.54	14.86
100	13.97	15.9	13.63	13.90
200	13.63	14.77	13.63	13.75
500	13.06	14.31	13.16	12.90
1000	12.60	13.00	12.00	12.50

Table 18b: Tensile strength of treated cotton (Fabric A) after dry and wet impact abrasion.

Strength %	Dry		Wet	
No. of Impacts	Untreated %	Treated %	Untreated %	Treated %
0	100.00	100.00	100.00	100.00
50	93.32	96.15	91.44	96.18
100	89.55	96.15	85.72	89.96
200	85.72	94.67	85.72	88.99
500	83.71	91.73	82.76	89.49
1000	80.76	83.33	75.47	80.90

Note: 15.6kg - Original strength 100% (Fabric A) untreated
15.9kg - Original strength 100% (Fabric A) treated

Table 19a: Tensile strength of treated Polyester/Cotton(67/33) (Fabric B) after dry and wet impact abrasion.

Strength (kg/2.5cm)	Dry		Wet	
No. of Impacts	Untreated Kg	Treated(5%) Kg	Untreated Kg	Treated(5%) Kg
0	30.20	30.00	30.08	30.00
50	29.08	29.08	29.08	29.08
100	29.00	29.08	28.18	27.41
200	27.27	28.18	27.26	27.34
500	25.47	26.36	25.49	26.50
1000	25.00	24.50	24.00	25.00

Table 19b: Tensile strength in percentage of treated Polyester/ Cotton (67/33) (Fabric B) after dry and wet impact abrasion.

Strength (%)	Dry		Wet	
No. of Impacts	Untreated %	Treated(5%) %	Untreated %	Treated(5%) %
0	100.0	100.0	100.0	100.0
50	96.93	96.93	96.96	96.96
100	96.66	96.93	93.93	92.80
200	90.90	93.93	90.86	91.36
500	84.48	87.86	84.96	88.33
1000	83.33	81.66	80.00	83.33

Note: 30kg - Original strength, 100% (Fabric B) untreated.
30kg - Original strength, 100% (Fabric B) treated.

Table 20a: Tensile strength of treated Polyester/Cotton (50/50) (Fabric C) after dry and wet impact abrasion.

Strength (kg/2.5cm)	Dry		Wet	
No. of Impacts	Untreated Kg	Treated(5%) Kg	Untreated Kg	Treated(5%) Kg
0	18.18	18.10	18.18	18.18
50	16.81	17.50	16.81	16.96
100	15.45	16.81	15.60	16.96
200	14.77	16.81	14.54	15.27
500	14.54	15.68	14.54	14.54
1000	13.50	14.00	13.38	13.75

Table 20b: Tensile strength in percentage of treated Polyester/ Cotton (50/50) (Fabric C) after dry and wet impact abrasion.

Strength (%)	Dry		Wet	
No. of Impacts	Untreated %	Treated(5%) %	Untreated %	Treated(5%) %
0	100.0	100.0	100.0	100.0
50	92.46	96.25	92.46	93.28
100	84.98	92.87	85.80	93.28
200	81.24	92.87	79.97	83.99
500	79.79	86.24	79.97	79.97
1000	74.25	77.34	73.59	75.63

Note: 18.18 kg - Original strength, 100% (Fabric C) Untreated
18.10 kg - Original strength, 100% (Fabric C) Treated

Table 21: Effect of acrylamide finish on elongation of cotton fabric after fl

Flat abra- sion. No.of rubs	Load (kg)	(%Conc) 0				2.5				5.0			
		5	10	15	at break	5	10	15	at break	5	10	15	a
0		5.0	7.2	9.2	10/19	3.3	5.3	6.6	8.0/18.0	3.3	5.3	6.3	8
500		6.0	8.0		97/13.2	4.6	6.6	8.0	8.0/16.0	3.5	5.8	7.0	
1000		6.3	8.7		10.2/11.3	4.0	5.3	8.6	8.0/16.0	3.5	6.2		
1500		6.5	8.6		9.7/10.5	4.0	6.6	8.0	8.0/15.0	4.2	6.6		
2000		6.2	8.3		9.9/10.0	4.6	6.6	8.0	8.0/12.50	4.0	6.8		
Impact abrasion													
No.of Impacts:													
0		5.0	7.2	9.2	10.8/19	3.3	5.3	6.6	8.0/18	3.3	5.3	6.3	
25		6.0	8.0	10.0	10/15.6	4.0	6.6	8.6	8.6/18.5	3.1	5.1	7.1	
50		6.0	8.0	10.0	10/14.1	3.3	5.3	-	7.3/15.0	3.3	4.8	6.6	
100		6.0	8.0	10.0	10/13.6	4.0	6.6		8.6/15.0	3.3	5.3	6.6	
200		6.0	9.0	10.0	10/13.0	4.6	6.0		6.6/14.5	3.3	4.6	6.6	
500		6.0	8.0	10.4	10/13.0	3.3	4.0		6.6/14.5	3.3	5.7	-	
1000		6.0	8.0	10.0	9/12.0	3.3	5.3		6.6/13.5	3.3	5.7	-	
Rotary abrasion													

Table 22a: Effect of acrylamide finish on elongation of polyester/cotton (67/33) fabric B after flat,

Flat abrasion

% Conc	0							2.5						
Load (kg)	5	10	15	20	25	30	at break	5	10	15	20	25	30	at break
No of rubs														
0	4.0	6.4	9.0	10.8	13.0	16.0	22/41	4.0	6.0	9.0	10.5	13.0	16.0	21.5/41
500	4.0	6.0	8.0	10.6	13.3	15.0	18/37.7	4.0	6.0	8.5	10.0	13.5	15.0	19/38
1000	4.3	6.4	8.8	11.3	13.0	16.6	20/37.3	4.5	6.0	8.0	11.4	13.5	16.0	21/37.5
1500	4.6	6.6	9.0	11.6	14.6	16.6	17/35.0	4.6	6.0	8.5	11.3	14.0	16.0	18/37
2000	4.6	6.5	9.3	12.0	14.8	18.6	18/32.0	4.6	6.5	9.0	12.0	13.5	17.0	19/35.5
Impact abrasion														
No of impacts														
0	4.6	6.5	9.0	11.0	13.4	16.0	21/41	4.0	6.0	9.0	10.5	13.5	16.0	22/41
25	4.0	7.0	9.0	12.0	15.0	18.0	21/38	4.5	6.5	8.0	10.0	13.5	14.0	20/38
50	4.0	7.0	11.0	14.0	17.0	21.0	23/37.7	4.8	6.0	8.0	11.3	15.3	16.0	21/38
100	4.0	7.0	10.0	12.0	14.0	18.0	22/37.5	4.3	6.3	8.3	11.0	13.0	15.0	22/38
200	4.0	7.0	10.0	12.0	14.0	18.0	21/36.6	4.3	6.0	8.3	12.0	14.0	15.0	20/37
500	4.0	7.0	10.0	13.0	17.0	21.0	21/37.0	4.0	6.1	8.3	11.5	16.0	18.0	21/36
1000	4.0	7.0	11.0	14.0	17.0	21.0	22/35.6	4.0	6.2	8.5	12.0	16.0	18.0	21/36
Rotary abrasion														

Table 22b: Effect of acrylamide finish on elongation of polyester/cotton 867/33) fabric B after flat, impact and rotary abrasion.

Flat abrasion														
% Conc	7.5							10.0						
Load (Kg)	5	10	15	20	25	30	at break	5	10	15	20	25	30	at break
No of rubs														
0	2.0	4.0	7.0	10.0	12.0	15.0	20/40	2.3	4.6	7.3	10.0	12.3	15.3	22/41
500	2.0	4.3	7.0	9.5	11.3	14.0	19/39	2.6	4.0	6.3	9.3	11.3	14.3	21/37.7
1000	2.0	4.0	7.0	9.0	11.3	13.0	18/38.6	2.6	4.0	6.6	10.5	11.9	14.0	22/37.3
1500	2.0	4.0	7.0	9.0	11.0	14.0	19/37.6	2.6	4.0	7.0	9.5	11.3	14.0	21/35
2000	2.3	4.3	7.5	9.5	11.5	13.0	18/36.8	3.3	4.0	6.3	9.0	9.5	12.0	21/32.0
Impact abrasion														
No of impacts														
0	2.0	4.0	7.0	10.5	12.0	15.0	20/40	2.3	4.6	7.3	10.0	12.3	15.3	21/41
25	2.0	5.6	7.0	9.4	11.0	14.0	19/40	2.6	4.6	7.3	9.3	12.3	15.3	20/38
50	2.0	4.5	7.0	9.5	11.0	13.0	18/39	2.6	4.3	7.0	9.0	11.3	14.0	19/37.6
100	2.5	4.0	7.0	9.5	11.0	14.0	19/38.5	2.6	4.3	7.3	9.0	11.3	14.0	18/37.5
200	2.3	4.4	7.3	9.0	10.5	14.0	19/37.3	2.3	4.6	7.3	9.3	13.3	13.6	19/36.6
500	2.3	4.0	7.4	9.3	10.5	14.0	19/36.6	2.2	5.3	8.0	10.3	13.3	14.3	20/37.0
1000	2.4	4.4	8.0	9.5	11.0	14.0	18/36.0	3.3	5.3	9.3	10.3	13.3	15.3	21/35.6
Rotary abrasion														

Table 23: Effect of acrylamide finish on elongation of polyester/cotton (50/5

Flat abrasion Load (Kg)	(% Conc)		0				2.5		
No. of rubs.	5	10	15	at break	5	10	15	at break	5
0	10.0	14.6	18	19/22	10.0	13.6	17.5	18/20	7.3
500	12.3	17.3	-	21/15	12.0	16.0	18	18/14	6.8
1000	11.6	17.3	-	18/12	11.6	16.0	-	18/14	7.3
1500	11.5	15.0	-	15/10	11.5	16.5	-	17/12	6.6
2000	11.7	17.0	-	17/9	11.0	13.5	-	14/11	9.3
Impact abrasion									
No. of impacts:									
0	10	14	18	28/22	10	13.5	17.5	18/30	7.3
25	9	14	19	24/20	9	13.5	16.5	20/20	7.0
50	9	14	18	22/19	9	13.5	17.0	19/20	7.3
100	9	14	17	20/18	9	13.0	17.0	19/19	6.6
200	9	14	17	20/18	9	14.0	16.0	19/18	8.3
500	9	13	16	19/16	9	13.0	16.0	19/18	7.3
1000	9	14	17	19/16	9	14.0	17.0	18/15	7.8
Rotary abrasion									
Rotary (min)									
0	10.0	14.5	18.0	23/22	10	13.5	17.5	22/20	6.0
5	12.0	16.4	20.0	24/21	12	14.0	16.5	20/20	6.6
10	12.6	16.9	21.0	24/19	11.5	15.0	17.0	22/19	6.6
15	11.3	14.6	18.0	23/18	11.2	16.0	-	20/15	8.2

0) fabric C after flat, impact and rotary abrasion.

5.0			7.5				10.0			
10	15	at break	5	10	15	at break	5	10	15	at break
12.0	16.0	19/22	6.0	10.0	13.0	18/21.5	6.0	10	13	18/22
11.5	16.0	16/16	6.5	11.5	14.0	17/16.5	6.0	12	-	13/14
12.21	-	17/16	6.3	11.5	-	14/14	6.0	-	-	12/8
11.5	-	16/14	6.5	11.0	-	14/13	6.0	-	-	11/7
16.0	-	16/12	6.5	12.0	-	15/12	6.0	-	-	6/5
12.0	16.0	19/22	6.0	10.0	13.0	18/21	6.0	10.0	13.0	19/22
10.6	14.0	19/21	6.5	9.0	13.0	18/20	6.0	9.5	13.5	20/22
11.3	14.6	19/21	6.0	9.0	13.0	18/20	6.0	9.6	13.5	19/21
9.6	13.3	16/20	6.4	8.5	13.5	15/20	6.0	9.0	14.5	18/20
12.0	16.0	20/19	6.0	9.0	14.0	19/18	6.0	9.4	13.4	19/20
11.7	16.6	16/17	6.5	9.0	14.5	15/17	6.0	9.6	13.6	19/20
14.6	14.6	14/16	7.0	9.0	13.0	12/17	6.0	9.0	14.0	18/19
12.0	16.0	19/22	6.0	10.0	13.0	18/21.5	6.0	10.0	13	18/22
11.0	15.0	18/21	6.0	10.0	11.0	18/21	6.0	10.5	12	19/21
11.0	15.0	17/19	6.0	10.0	12.0	20/20	6.0	10.0	12	19/20
12.6	16.0	20/18	6.0	9.0	11.0	18/18	6.0	9.5	11	19/20

5.6 Influence of Acrylamide finish on other properties of fabric A, B and C

In the present study along with influence of acrylamide finish on abrasive wear, its effects on other properties of fabrics were also studied and those properties were: tearing strength, stiffness, wrinkle recovery and air permeability of the fabrics.

5.6.1 Influence of acrylamide finish on tearing strength of fabrics A, B and C.

As evident from the Fig.25 and Tables 24a and 24b, as the concentration of the finish increased, there was decrease in the tearing strength retention of fabrics. Fabric A had shown more strength loss with increased concentration of finish as compared to fabric B and C. Fabric B had shown gradual strength loss with 5.0, 7.5 and 10.0 percent concentration of acrylamide finish. Fabric C showed similar results. Minimum strength loss was shown with 2.5 percent acrylamide finish and it was 5.28 gms, 64 gms and 23 gms for fabric A, B and C respectively. Maximum strength loss was shown with 10.0 percent acrylamide finish and there was 272.0 gms, 144.0 gms and 235 gms strength loss for fabric A, B and C respectively.

Thus it was found that with the increased concentration of finish, there was an increase in the strength loss of/..

of all the fabrics. This showed that finish did not penetrate properly and at higher concentration, it remained on the fabric surface only.

It was also reported by Frick and Harper (27) that loss of fabric strength occurred on treatment with acrylamide aldehyde products as with usual cross-linking treatment and loss of tearing on treatment with acrylamide glyoxal product was about the same as with DMDHEU. The loss was less than obtained with glyoxal alone, even when the glyoxal treatment gave lower wrinkle recovery angles.

5.6.2 Influence of Acrylamide finish on stiffness of fabrics.

Results are shown in Table 25 and Fig.26. It was noted that there was increase in stiffness with the increase in concentration of acrylamide finish. Treated fabrics have shown more stiffness as compared to untreated fabrics, because acrylamide when polymerised with cotton fabrics, the reaction took place on the surface only. Acrylamide finish did not penetrate the fibres thoroughly and therefore it formed a surface coating, due to which fabrics became stiff. It was noted that up to 5% acrylamide finish there was not much change in stiffness for all the fabrics but with higher concentrations i.e. 7.5 percent and 10.0 percent finish/..

finish, there was greater increase in the stiffness in fabric A whereas for fabric B and C there was not much difference.

5.6.3 Influence of acrylamide finish on wrinkle recovery of fabrics A, B and C.

As shown in Table 26 and Fig.27 it was found that there was little improvement in wrinkle recovery with 2.5 percent and 5.0 percent acrylamide finish. Whereas with 7.5 percent and 10.0 percent finish this property was reduced in the case of Fabric A. Results on wrinkle recovery of fabric B and C were similar to fabric A and these are shown in Figs. 28 and 29.

It was noted that up to 5.0 percent acrylamide finish, there was some influence on the internal structures of fibre because of some improvement in the wrinkle recovery property. After that up to 10.0 percent the finish remained on surface of fabrics only. Frick (26) also reported that after the fabrics were treated with acrylamide finish the recovery angles were low.

It was also reported by Chaudhary (13) that after treatment of fabric with acrylic acid the wrinkle recovery of polyester fabric was lowered. Jain (40) also reported that lower concentration of the finish improved wrinkle recovery of fabrics marginally. But curing reduced the wrinkle recovery in cotton fabric. Polyester fabric had no effect and blend of Polyester/Cotton had shown some/..

some improvement.

5.6.4 Influence of acrylamide finish on air permeability of fabric A, B and C.

Results are given in Table 27 indicating a general deviation attributable to fabric irregularity. They supported the microscopical observation, that the finish adhered randomly to fibres and did not block pores or interlaces.

Thus the results of this study showed that acrylamide improved the resistance to flat, rotary, impact and dry wet impact abrasion of fabrics. It protected the fabrics against all the four abrasive wear by its flexibility. Acrylamide finish also improved other properties of fabrics like tensile strength stiffness and wrinkle recovery at its lower concentrations. Investigators - Maity (45), Cooper (17), Yamamato (44) and Shet (65) have reported that with the use of acrylamide and acrylate co-polymer certain properties can be improved like - tensile strength, abrasion resistance, good durability to repeated laundering, resistance to hydrolysis, crease recovery etc.

Table 24a: Tearing strength of fabrics at varying concentration of acrylamide finish .

Fabric code	Cotton (A)	Polyester/Cotton (67/33) (B)	Polyester/Cotton (50/50) (C)
Strength (gm) Conc.of finish	gms	gms	gms
0	597.33	1056.0	816.0
25	592.00	992.0	793.6
50	453.28	981.2	752.0
75	437.21	960.0	586.5
100	325.28	912.0	581.2

Table 24b: Tearing strength of fabrics at varying concentration of acrylamide finish.

Fabric code	Cotton (A)	Polyester/Cotton (67/33) (B)	Polyester/Cotton (50/50) (C)
Strength (%) Conc. of finish	%	%	%
0	100.0	100.0	100.0
25	99.11	93.39	97.25
50	75.89	92.91	92.16
75	73.21	90.90	71.87
100	54.05	86.33	71.22

Note: 597.25 gms - Original strength, 100% (Fabric A)
1056.00 gms - Original strength, 100% (Fabric B)
816.00 gms - Original strength, 100% (Fabric C)

Effect of Acrylamide finish on tearing strength (FabricsA,B&C)

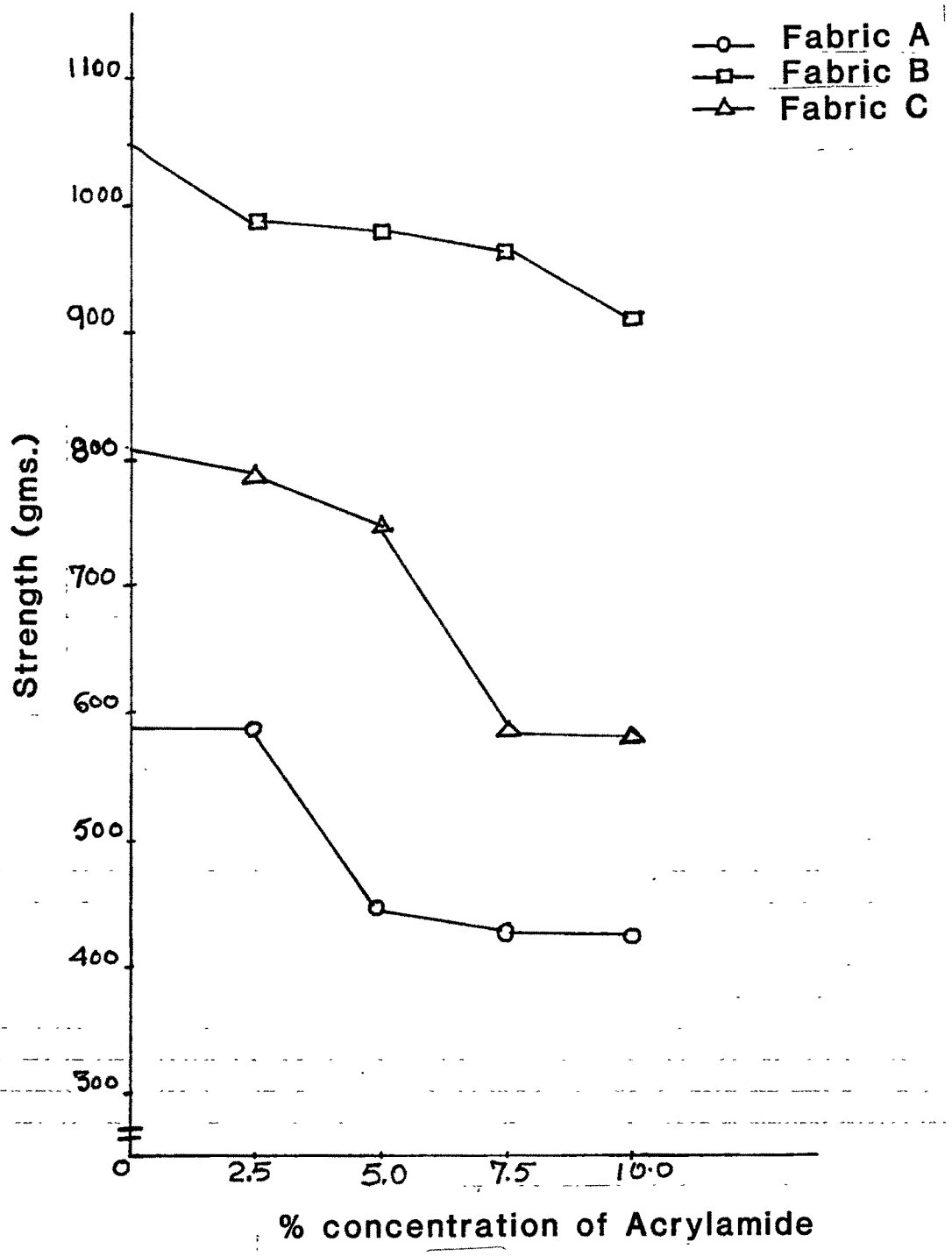


Fig.25

Table 25: Influence of acrylamide finish on stiffness on the fabrics.

Faric code	Cotton (A)	Polyester/Cotton (B)	Polyester/Cotton (C)
Stiffness (cm) Conc. of the finish (Y)	(cm)	(cm)	(cm)
0	2.28	2.21	1.97
2.5	3.27	3.24	2.91
5.0	4.53	4.75	4.71
7.5	5.87	4.91	4.97
10.0	7.85	5.50	5.75

Effect of Acrylamide finish on stiffness

(Fabrics A,B&C)

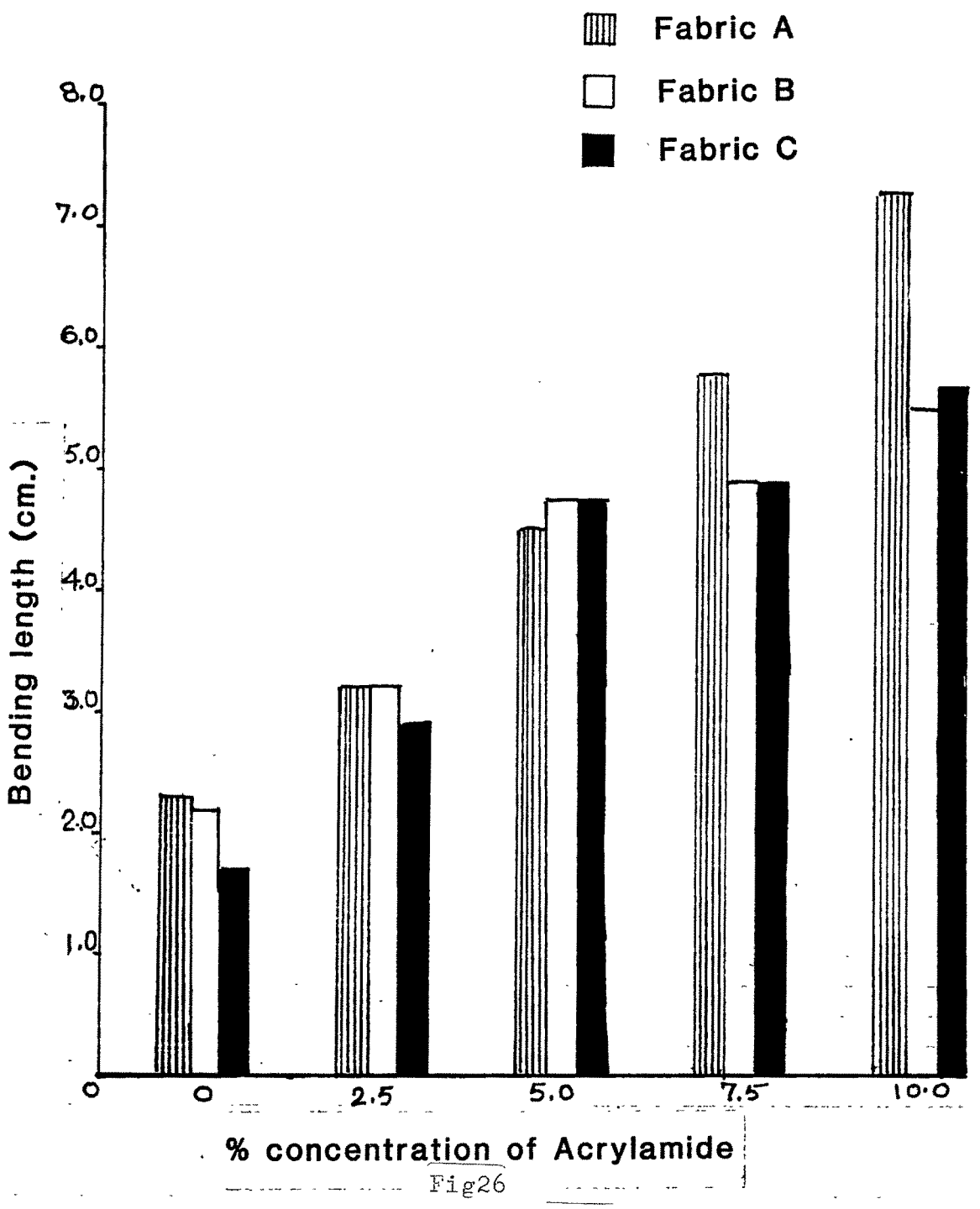


Fig26

Table 26: Wrinkle recovery of fabrics treated with acrylamide.

Fabric code		Cotton (A)		Polyester/Cotton (B)		Cotton/Polyester (C)	
Concentration of the finish (%)		0		0		0	
Untreated		Imm.	5 min.	Imm.	5 min.	Imm.	5 min.
Warp	0	70.0	79.0	104.0	129.0	112.0	125.0
Weft		73.0	79.5	120.0	133.0	110.0	120.0
Warp	2.5	73.80	86.30	109.8	123.1	110.7	125.9
Weft		80.20	92.73	116.0	129.6	116.4	130.0
Warp	5.0	53.5	70.7	88.0	104.0	98.5	108.5
Weft		60.0	70.2	91.2	105.0	92.0	102.5
Warp	7.5	48.3	62.0	86.0	100.0	92.25	109.0
Weft		53.3	67.15	89.0	104.5	83.75	100.0
Warp	10.0	48.15	61.05	77.62	93.02	75.96	91.30
Weft		48.90	65.00	81.33	94.78	77.70	91.30

Effect of varying concentrations of Acrylamide finish on wrinkle recovery (Fabric A)

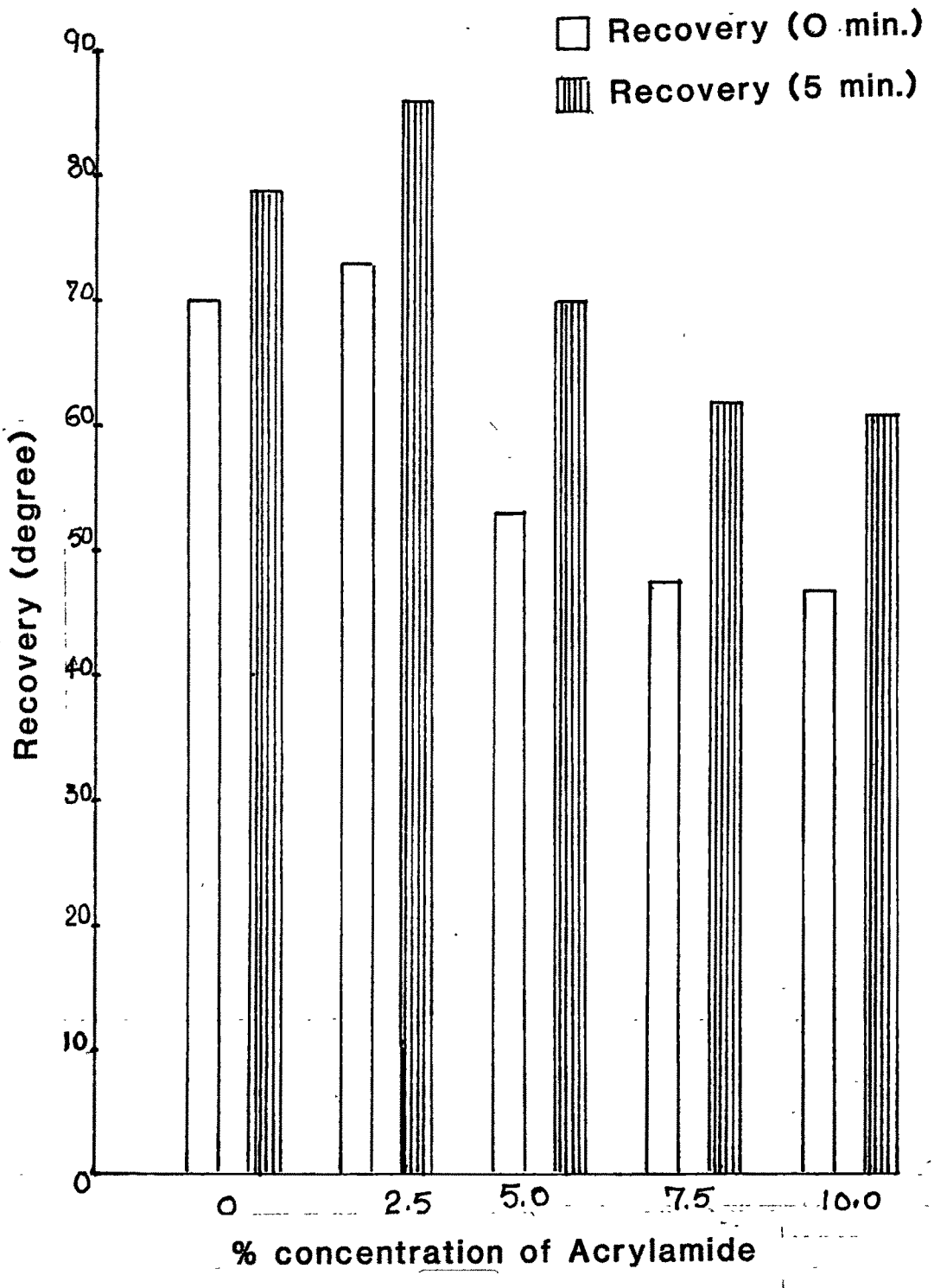


Fig27

Effect of varying concentrations of Acrylamide finish on wrinkle recovery (Fabric B)

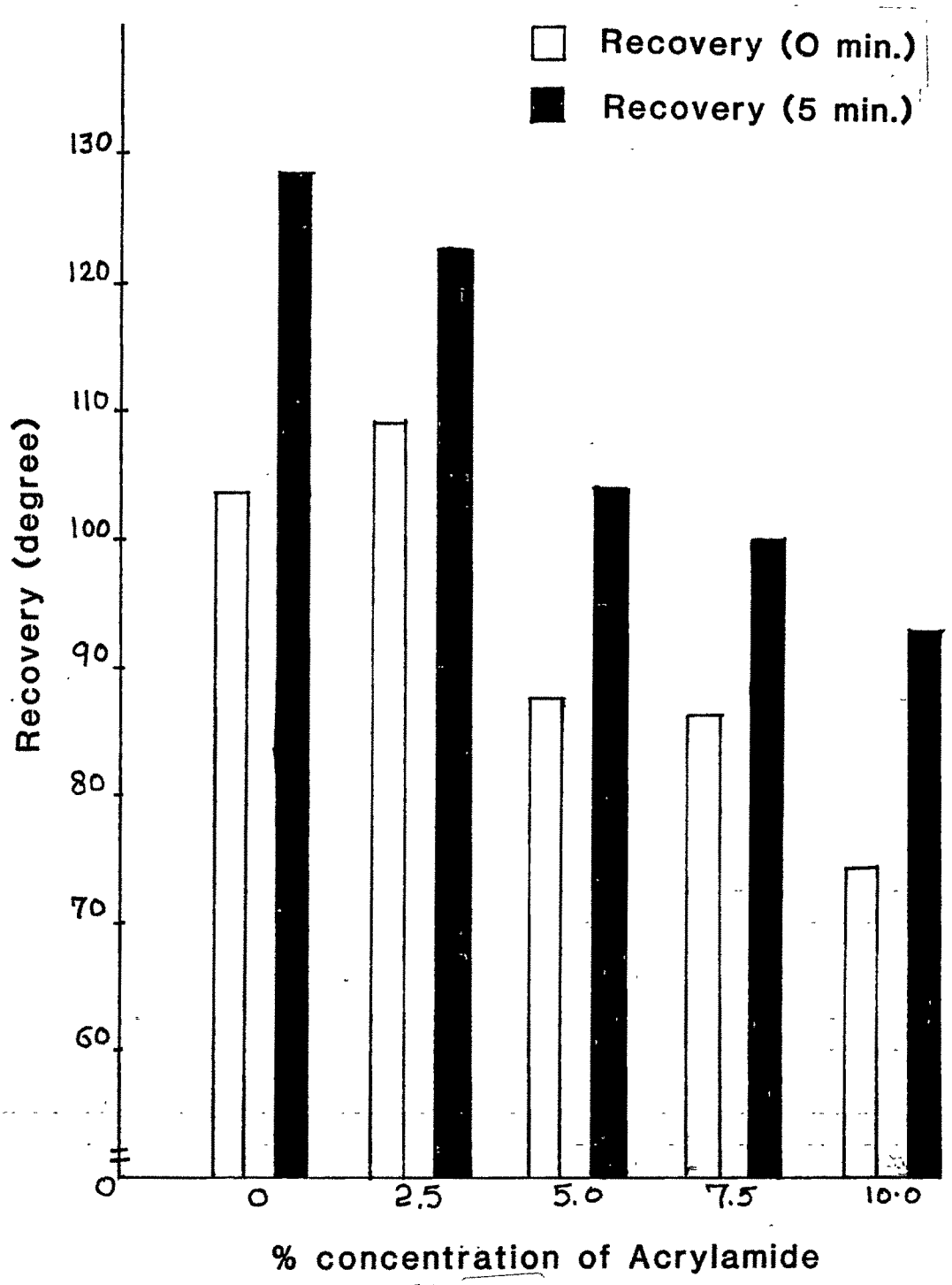


Fig28

Effect of varying concentrations of Acrylamide finish on wrinkle recovery (Fabric C)

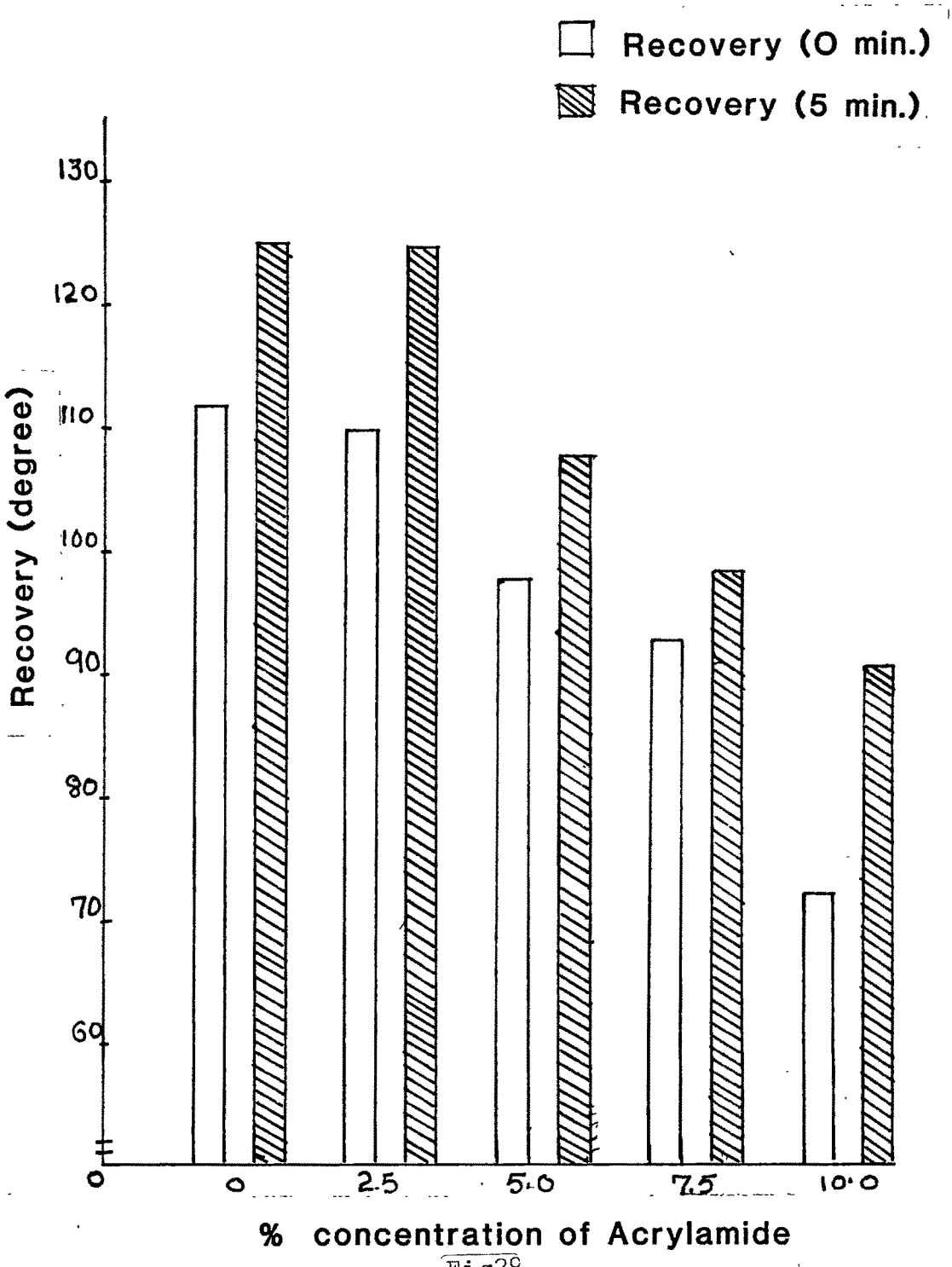


Fig29

Table 27: Determination of Air Permeability of Fabrics

% Conc. of Finish	Cotton(A) $ml/cm^2/Sec$	Cotton/Polyester(B) $ml/cm^2/Sec$	Cotton/Polyester(c) $ml/cm^2/Sec$
0	54.0	16.0	50.0
2.5	41.5	14.0	46.0
5.0	57.0	17.0	56.5
7.5	65.0	16.5	48.0
10.0	70.0	17.0	37.5

Readings were taken at 1 mm water gauge.