EXPERIMENTS ON PRESERVATION AND WEATHERING OF NET TWINES

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INTRODUCTION

Koura (1963) reporting the results of the comparative studies on different preservation methods of cotton twines stated that "by the difference of rotting in the different waters, not ever one method may be the most economical one". The observations were simultaneously made at Alexandria in Egypt in the sub-tropical region and Cuxhaven in the estuary of the River Elbe in the temperate zone. The course of weathering and effect of immersion in water of man-made fibres have also been mentioned in this communication. Subsequently work on similar lines were extended to Cochin in the tropical region with Cuxhaven and Hamburg as the other places of observation and the results of these studies are presented in this paper.

The authors are indeed indebted to Prof. A. von Brandt, Director, Institut Fur Fangtechnik, Hamburg for permission to make use of the data from Cuxhaven and Hamburg. To Dr. A. N. Bose, the then Director of the Central Institute of Fisheries Technology the authors would like to record their sincere thanks for the encouragement given in the course of the studies.

MATERIALS AND TREATMENT METHODS

Cotton twines of specification N_m 50/15 (20 Tex/15) treated with different preservatives having cutch as base and synthetic twines representing different groups of polymers formed the materials for the tests.

The methods of preservation were those described by von Brandt (1955) and as further detailed by Koura *(op. cit).*

Places of experiments:

The two stations selected for conduct of the studies were Cochin backwaters in the tropical region and Cuxhaven in the temperate zone.

In Cuxhaven waters the salinity ranged between 6 and 20 o/oo and temperature from 1.5 to 18°C. At Cochin the salinity variation was a little more marked. During the months of the monsoon, it was as low as 2 o/oo while in the post monsoon period a maximum of 34 o/oo was recorded. The temperature variation was, however, negligible ranging between 28-30°C.

Period of tests:

(a) Immersion experiments extended from 1-4-1965 to 18-6-1968 at Cuxhaven and from 28-5-1965 to 22-9-1966 at Cochin. There was an interruption of 3 months (1-12-1965 to 28-2-1966) at the former centre.

(b) Samples for weathering tests were exposed for the period extending from 30-4-1965 to 13-6-1968 at Hamburg and from 6-6-1965 to 22-9-1966 at the latter centre.

Method of test:

The breaking strength of the samples was recorded at specific intervals and the course of deterioration determined on the basis of the retained strength.

RESULTS

Text Figs. 1 and 2 show the course of rotting of treated cotton twines at the two test sites. The changes in strength of man-made fibre twines under continuous immersion are presented in Text Figs. 3 and 4. Text Figs. 5 to 8 depict the deterioration of synthetics and treated cotton twines by weathering.

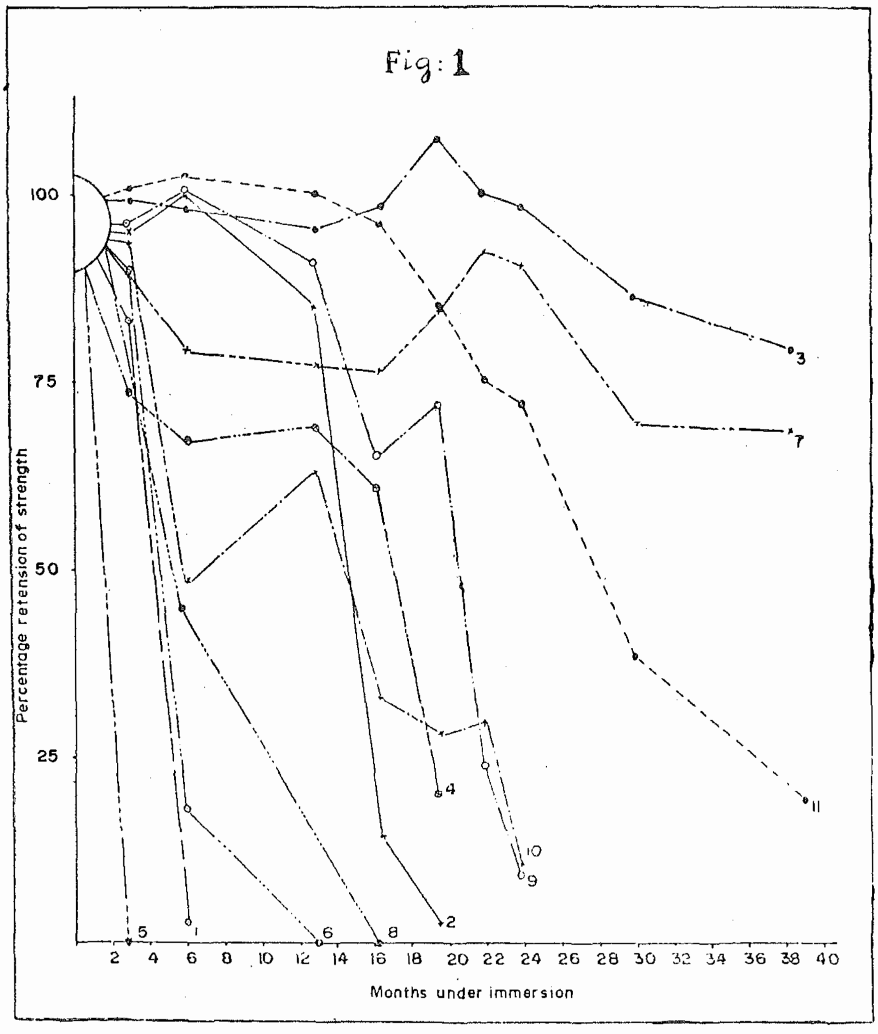

Fig. 1: Course of rotting of treated cotton twines under immersion. Place: Cuxhaven. 1. Cutch + Carboleneum. 2. Cutch + Testalin + Carboleneum. 3. Cutch fixed with $K_2Cr_2O_7$ + Carboleneum. 4. Cutch fixed with $CuSO_4$. NH_3 + Carboleneum. 5. Cutch. 6. Cutch + Testalin. 7. Cutch fixed with $K_2C_2O_7$. 8. Cutch fixed wlth $CuSO_4$ NH_3 9. 10% Arigal C + 0.25% Arigal PMP 10. 12% Arigal C + 0.25% Arigal PMP 11. 15% Arigal C + 0.25% Arigal PMP

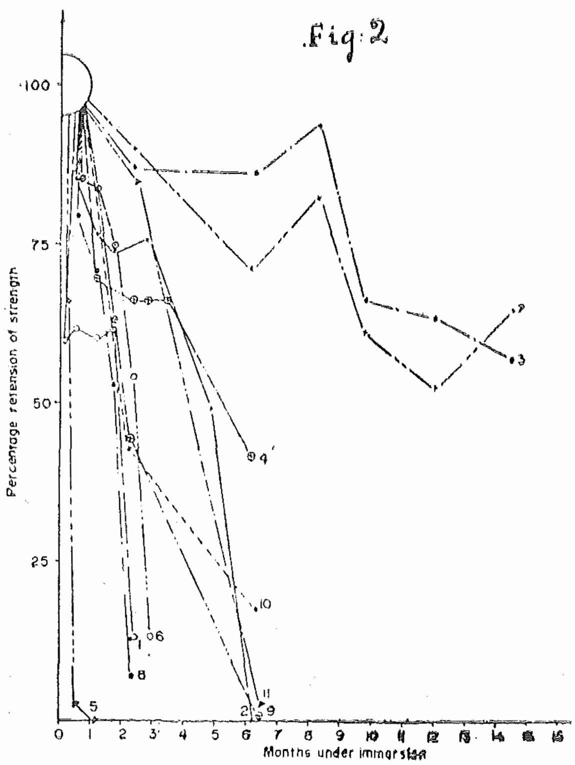

Fig. 2: Course of rotting of treated cotton twines under immersion. Place: Cochin. 1. Cutch + Carboleneum 2. Cutch + Testalin + Carboleneum 3. Cutch fixed with $K_2Cr_2O_7$ + Carboleneum 4. Cutch fixed $CuSO_4 . NH_3$ + Carboleneum 5. Cutch 6. Cutch + Testalin 7. Cutch fixed with $K_2Cr_2O_7$ 8. Cutch fixed with $CuSO_4$ NH_3 9. 10% Arigal C + 0.25% Arigal PMP 10. 12% Arigal C + 0.25% Arigal PMP 11. 15% Arigal C + 0.25% Arigal PMP.

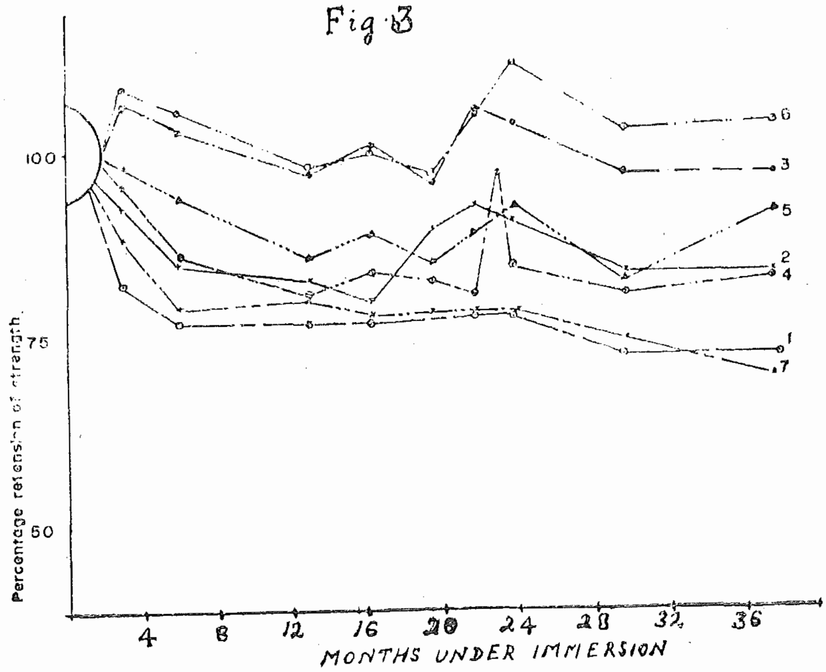

Fig. 3: Changes in strength of synthetics under immersion. Place: Cuxhaven 1. Polyamide — Perlon (Staple) 2. Polyamide — (Continuous) 3. Polyamide — Perlon (monofilament) 4. Polyester — Trevira 5. Polypropylene — (Continuous) 6. Polyethylene — Nymplex (monofilament) 7. Polyvinyl alcohol — Trawlon.

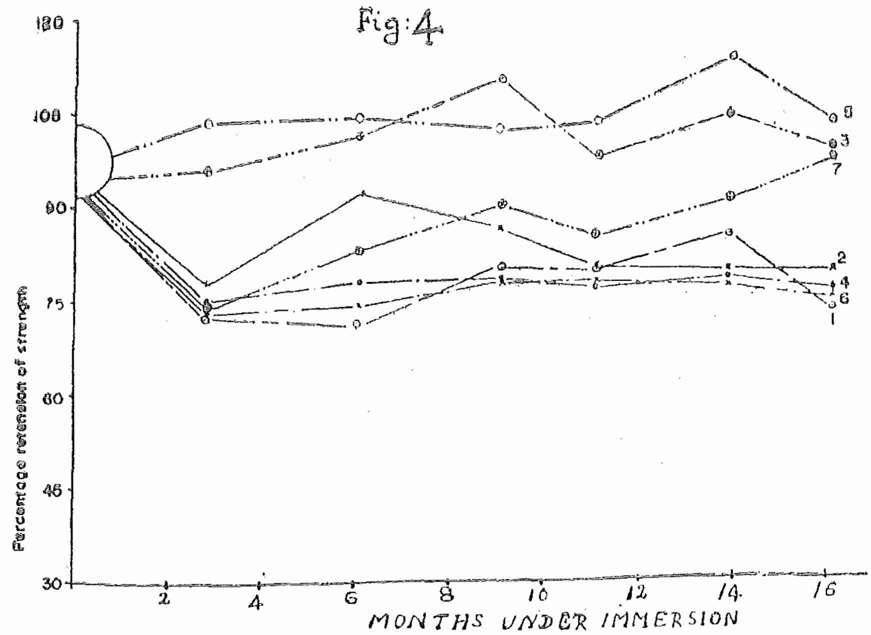

Fig. 4: Changes in strength of synthetics under immersion. Place: Cochin
1. Polyamide — Perlon (Staple) 2. Polyamide — (Continuous) 3. Polyamide — Perlon (monofilament) 4. Polyester — Trevira 5. Polypropylene — (Continuous) 6. Polyethylene — Nymplex (monofilament) 7. Polyvinyl alcohol — Trawlon.

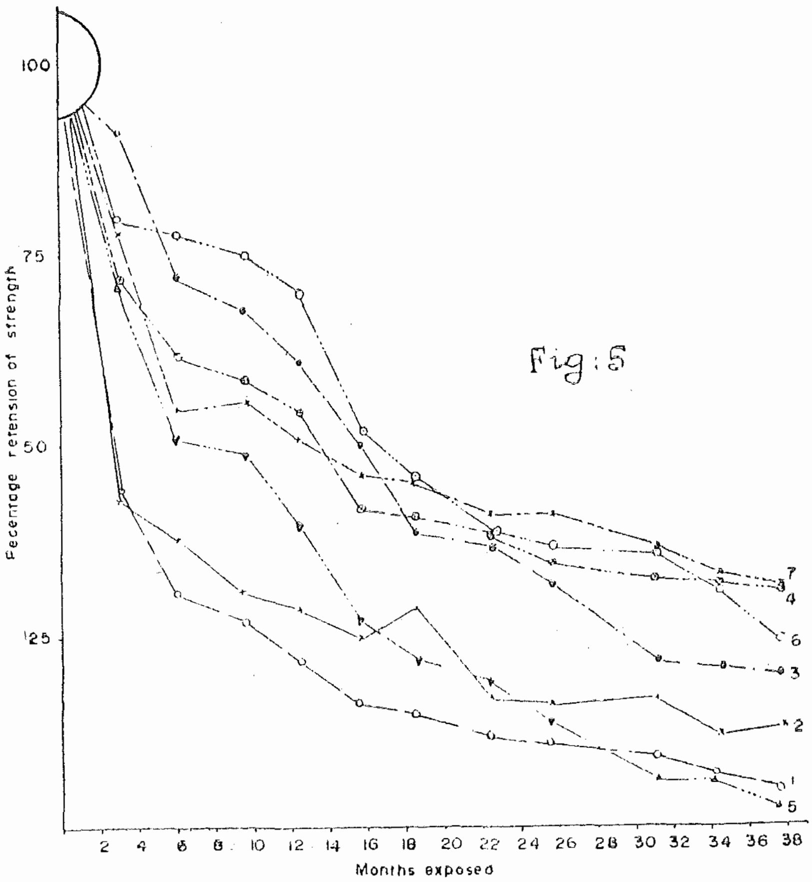

Fig. 5: Weathering of synthetics on exposure to sunlight. Place: Hamburg
1. Perlon (Staple) 2. Nylon (Continuous) 3. Perlon (monofilament) 4. Polyester — Trevira 5. Polypropylene — (Continuous) 6. Polyethylene — Nymplex (monofilament) 7. Polyvinyl alcohol — Trawlon.

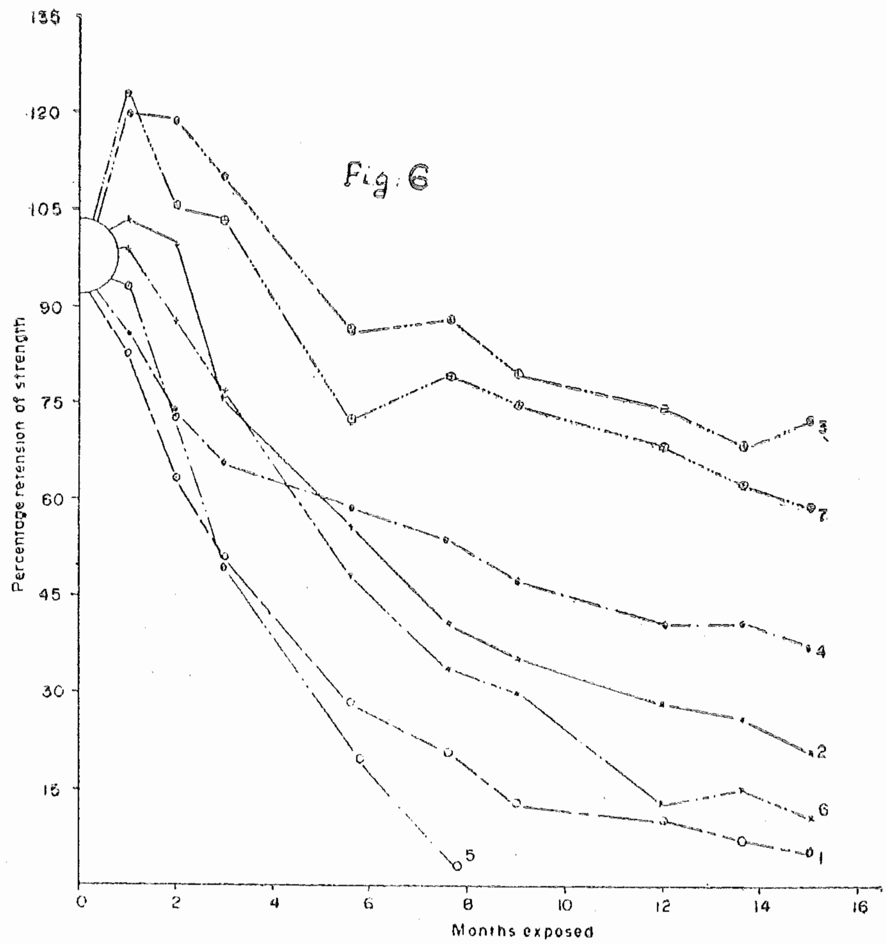

Fig. 6: Weathering of synthetics on exposure to sunlight. Place: Cochin
1. Perlon (Staple) 2. Nylon (Continuous) 3. Perlon (monofilament) 4. Polyester — Trevira 5. Polypropylene — (Continuous) 6. Polyethylene — Nymplex (monofilament) 7. Polyvinyl alcohol — Trawlon.

DISCUSSION

A: Continuous immersion tests:

(i) Treated cotton twines:

The utility of preservative treatment was assessed by comparing the number of effective days i. e., the number of days by which the treated twines lose half their original strength, (Kuriyan *et. al* 1962). Table I presents the number of effective days recorded at the two test sites.

The order of effectiveness of the preservatives is almost similar at both the test sites. It is, therefore, apparent that the preservative power is independent of salinity and temperature of the water. However, since these physical factors directly influence the rotting medium, the twines undergo deterioration at a quicker or slower rate according to tne location of exposure. At Cochin the medium has a greater rotting power than Cuxhaven waters.

The effectiveness of the different preservatives could be further detailed as follows:

(a) Cutch:

Cutching alone is not effective at both the sites. The observation corroborates the view of Takayama and Shimozaki (1957) that the acid film formed on the

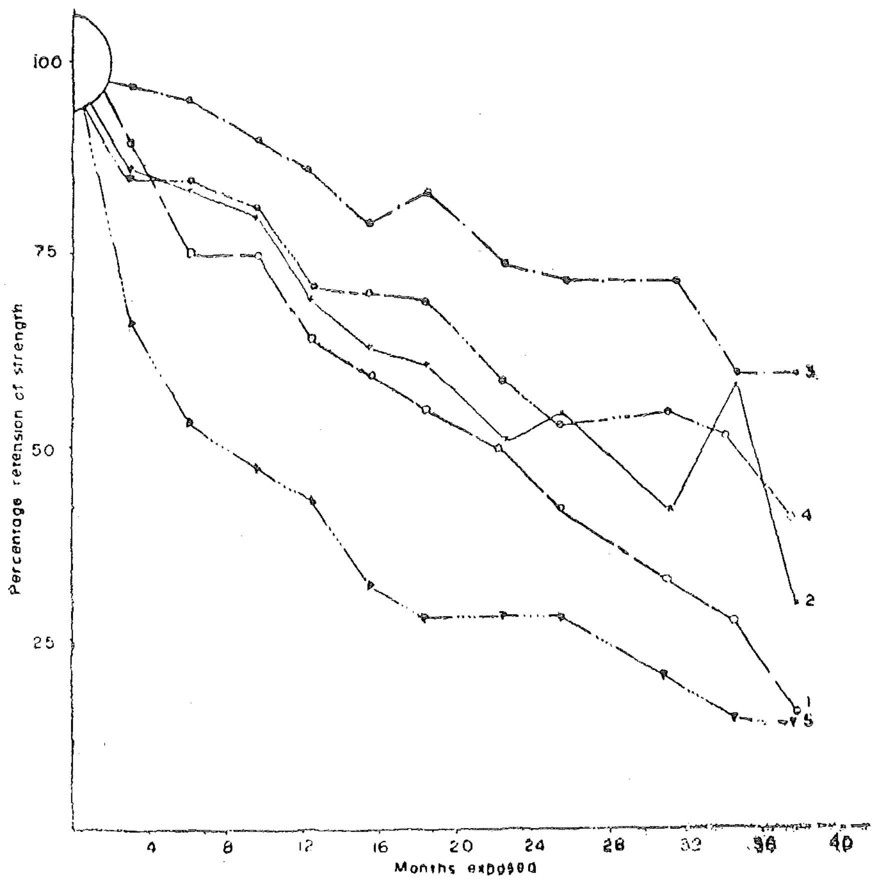

Fig. 7: Weathering of treated cotton twines on exposure to sunlight. Place: Hamburg 1. Cutch + Carboleneum 2. Cutch + Testalin + Carboleneum 3. Cutch fixed with $C_2Cr_2O_7$ + Carboleneum 4. Cutch fixed with $CuSO_4NH_3$ + Carboleneum 5. 15% Arigal C + 0.25% Arigal PMP.

TABLE I

Sl. No.	Method of treatment	Effective Days Cuxhaven (in months)	Cochin (in weeks)
1	Cutch + carboleneum	4.3	7.4
2	Cutch + Testalin + Carboleneum	14.6	19.2
3	Cutch fixed with $K_2 Cr_2 O_7$ + Carboleneum	Not reached	
4	Cutch fixed with $CuSO_4 . NH_3$ + Carboleneum	17.0	21.0
5	Cutch	1.5	1.1
6	Cutch + Testalin	4.7	9.4
7	Cutch fixed with $K_2 Cr_2 O_7$	Not reached	
8	Cutch fixed with $CuSO^4 . NH_3$	5.6	7.0
9	10% Arigal C + 0.25% Arigal PMP	20.6	8.0
10	12% Arigal C + 0.25% Arigal PMP	14.5	8.0
11	15% Arigal C + 0.25% Arigal PMP	28.0	11.4

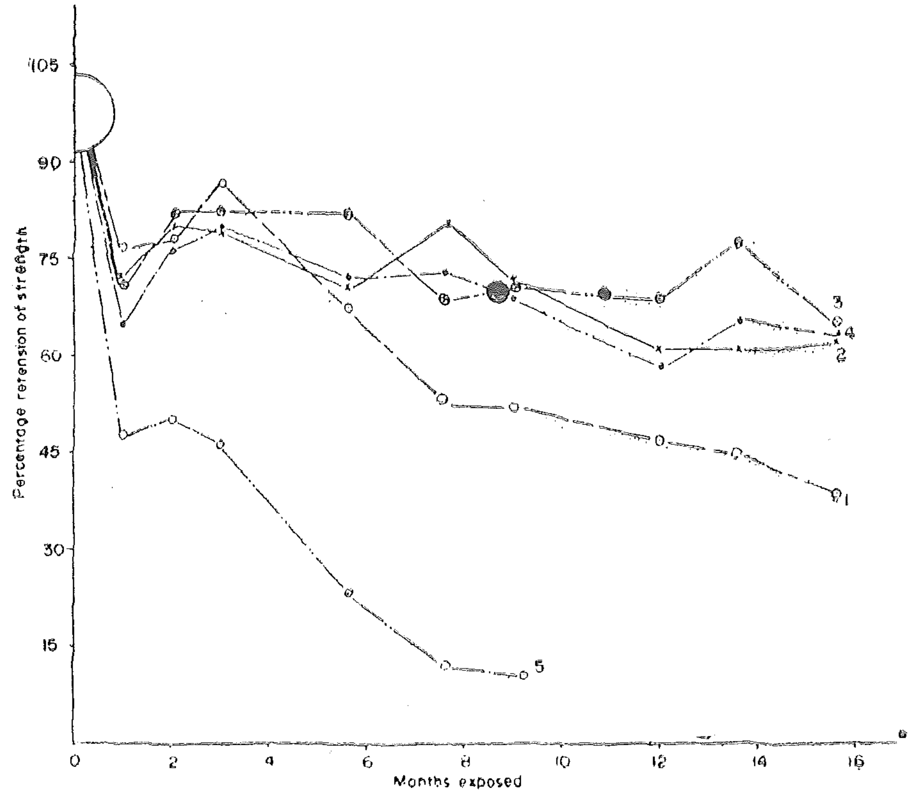

Fig. 8: Weather of treated cotton twines on exposure to sunlight. Place: Cochin. 1. Cutch + Carboleneum 2. Cutch + Testalin + Carboleneum 3. Cutch fixed with $K_2Cr_2O_7$ + Carboleneum 4. Cutch fixed with $CuSO_4NH_3$ + Carboleneum 5. 15% Arigal C + 0.25% Arigal PMP

net by tannin products would remain on the net no longer than a week, if the net is in continuous use. Miyamoto (1958) has also opined that the soluble nature of tannin restricts the use of exclusive cutch treatment for preservation of net twines.

(b) Cutch fixation:

Fixation by oxidation is effected with reagents like Potassium dichromate (Spezialgerbung process – von Brandt, *op. cit.*) and ammoniacal copper sulphate (Dutch method – Olie 1913)*. At both test sites, fixation with pot. dichromate showed better results. The percentage retention of strength of samples at Cochin was 57% after an immersion period of 14.5 months while at Cuxhaven it was 68% after 38.5 months.

* not consulted in original

Fixation with copper sulphate and ammonia was not as effective as the former method. The observation supports the experimental results of Koura (op. cit.). The author is of the opinion that the high salinity acts as a limiting factor in the preservative effect, when copper salts are used as copper, ions get exchanged with other metallic ions in the sea water.

Carboleneum:

Being an oil it acts as a water repellent. It afforded not much added advantage to fixation with potassium dichromate. In combination with other treatments it enhanced the effectiveness of the concerned method.

Arigal C:

Preservative effects at the two test sites showed vast variation. While at

Cochin test samples deteriorated within six months, those immersed at Cuxhaven retained a high percentage of the initial strength for more than a year.

(ii) Synthetic twines: Irrespective of the medium, synthetics uniformly retained good strength even after immersion for more than one year. There was practically no reduction in strength in the polyamide and the polyethylene monofilaments. Staple fibre twines of the polyamide, the polyester, and the polyvinyl alcohol groups showed less retention of strength and the values recorded at both the test sites were almost equal for the same period of immersion.

B. Weathering tests:

The weathering resistance of the different samples exposed was also assessed on the basis of the number of days taken to reduce the original strength to the 50% level.

(i) Sythetic twines: Table II shows the results of tests on sythetic twines.

TABLE II

Sl. No.	Name of material	Time taken for original strength to reach 50% level (in months) Cuxhaven	Cochin
1	Perlon (staple) Nm 20/9 (50 Tex x 9), 1964	2.6	3.0
2	Nylon (continuous) Td 210 x 15 (23 Tex x 15), 1964	2.6	6.4
3	Perlon (monofilament) 0.2 mm x 16, 1960	15.5	15.5+
4	Polyester Trevira Nm 20/9 (50 Tex x 9), 1961)	13.6	8.6
5	Polypropylene (continuous) Td 190 x 12 (21 Tex x 12), 1964	7.4	3.0
6	Polyethylee - Nymplex 0.24 x 0.48 3/2, 1965	16.6	5.2
7	Polyvinyl alcohol - Trawlon Ne 20/18 (30 Tex, x 18), 1965)	12.5	15.5+

It would be evident from the Table II that, while at Coohin both Perlon monofilament and the polyvinyl alcohol showed high resistance to weathering, at Hamburg best results were obtained with monofilaments of Perlon and the polyethelene. The behaviour of Nymplex (polythelene) at Cochin is in striking contrast to that recorded at Hamburg. Polypropylene, comparatively new entrant in the fishing industry showed only less weather resistance at both test sites. Taking the polyamide group as a whole, it can be seen that the order is monofilament, continuous and staple fibre. This is almost identical at both test sites.

(ii) Treated cotton twines: Prepared cotton twines, other than those treated with Arigal C, retained high percentage of strength at the two sites, for over a period of one year. While the samples at Cochin were all exhausted by this time, tests at Hamburg were prolonged. The percentage retention of strength of the different samples at the latter test site after 37.5 months of exposure was:

TABLE III

	Treatment	% retention of strength
1	Cutch + Carboleneum	16
2	Cutch + Testalin + Carboleneum	30
3	Cutch fixed by $K_2Cr_2O_7$ + Carboleneum	60
4	Cutch fixed by $CuSO_4$ + Carboleneum	41
5	15% Arigal + 0.25% Arigal PMP	15

It is worth noting that treatment no. (4) which afforded good protection against rotting was also effective under weather exposure tests.

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