

PRELIMINARY STUDIES ON THE PRESERVATION OF SUNN-HEMP FISHING NET TWINES

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INTRODUCTION

PERHAPS ranking next to cotton, sunn-hemp is an important fishing gear material used for the fabrication of gill nets, shore seines, boat seines, stake nets and the like. Certain details of the characteristics of the sunn-hemp twines have been presented in an earlier communication (Miyamoto and Shariff, 1959 *b*). Being a fibre of vegetable origin, it is susceptible to bacterial action resulting in what is popularly known as 'sea rot' of the fishing net twines. Preservation of the twines of this fibre, either to prevent rotting completely or to retard the progress of the bacterial action, is an imperative necessity viewed from the standpoint of the economic well-being of those fishermen, who depend upon it for the pursuance of their profession. In this paper, the preliminary studies undertaken for the preservation of sunn-hemp twines following the continuous immersion method are discussed.

MATERIALS AND METHODS

(A) Materials

Samples of sunn-hemp twines (*Crotalaria juncea*) used in these experiments were collected from Tanjore District in Madras State, where a fairly lucrative trade for this fibre exists. Specifications of the twines, as indicated by the dealer, were No. 31, 7 strands and No. 31, 6 strands.

(B) Preservatives and Preservation Methods

Series (a)

The general pattern of this series of experiments was to investigate the utility of cutch, chemical preservatives and coal-tar mixed with kerosene for preserving these twines. Sunn-hemp twines (No. 31, 7 strands) each of 5 length and of 2.23 gm. per meter were treated with the preservatives given below, following the method indicated against each preservative.

(i) *Cutch*.—About 60 gm. (Tablet cutch) was powdered and dissolved in a litre of water. The twines were immersed in this solution for about 6 hours and then dried in shade. The dyeing was repeated a second time to ensure the impregnation of the preservative and the wet twines were dried for 4 days. The treated twines were reddish-brown in colour, soft and pliable and were shrunk by about 0.7% of the original length.

(ii) *Mixture of Garnol and kerosene*.—The twines were treated with a mixture of 216 c.c. of Garnol with 434 c.c. of kerosene for 20 minutes and dried. The twines after treatment were green in colour, slightly soft and were shrunk by about 0.53% of the original length.

(iii) *Standard green cuprinol*.—The twines were treated with 650 c.c. of the preservative for about 20 minutes and then dried. The treated twines were dark green, soft and the shrinkage was about 1.2%.

(iv) *B.C. Green cuprinol*.—Treatment of twines as in No. (iii). The treated twines were green and very stiff.

(v) *Brown cuprinol*.—Similar treatment of twines as in No. (iii).

(vi) *Cunilate 611 F.N.T.*—The twines were treated for 20 minutes in this preservative and dried. After treatment, they were blackish-brown in colour and found shrunk by about 0.95%.

(vii) *Coal-tar and kerosene*.—A mixture of coal-tar and kerosene in the ratio of 3:1 was used as the next preservative. The twines were treated in this mixture for 20 minutes and dried. The treated twines were black, slightly stiff and shrunk by about 0.95%.

Series (b)

The purpose of this series was to study the action of the chemical preservatives not included in the earlier series, the effect of the tannin extracts of bark and fruits, the indigenous preservatives and the utility of coal-tar for a subsequent treatment of cutch-treated twines. The extracts from the barks and fruits were prepared following the salient features of the indigenous preparation methods. Samples of twines (No. 31; 6 strands) of 5' length and each having an average mass of 2.01 gm. per meter were treated with the preservatives given below and under the method described for each.

(i) "*Kalagam*" (Odina wodier).—8 ounces of crushed bark of kalagam was boiled with 4 litres of water until two litres of the extract remained. The bundle of twines was treated with the cooled and filtered extract for about 12 hours. The twines were then dried for a day (24 hours), re-dyed in the

same extract and dried for 2 days. The twines thus treated were reddish-brown in colour, soft and flexible and were shrunk by about 2.06%.

(ii) "*Panachikka*" (fruits of *Diospyros embryopteris*).—3 lb. of the green fruits were crushed to form a paste and stirred well with a litre of water. The purple sticky extract was filtered after 3 hours and the twines treated in this solution. The twines were purple in colour, hard and very stiff and were shrunk by about 2.95%.

(iii) *Marstein*.—The twines were treated in half a litre of this solution for about 20 minutes and dried for 5 days. The twines so treated were blackish-green in colour, slightly stiff and found shrunk by about 0.75%.

(iv) *Net life green*.—The twines were dipped in this preservative for about 20 minutes and dried for 5 days. Treated twines were green in colour, soft and shrunk by about 0.75%.

(v) *Mixture of Cunimine with kerosene*.—The bundle of twines was treated in a mixture of 200 c.c. of Cunimine with 300 c.c. of kerosene for 20 minutes. The resultant-treated twines were blackish-brown, fairly stiff and shrunk by about 0.95%.

(vi) *Cutch with coal-tar and kerosene*.—12 gm. of cutch was dissolved in a litre of water and boiled. The twines were treated in this solution after cooling and dried in shade. The cutch-treated twines were further submitted to treatment with a mixture of coal-tar and kerosene (3:1) for a period of 20 minutes. The dry-treated twines were black in colour and found shrunk by about 1.25%.

(vii) "*Kalagam*" with coal-tar.—The twines similarly treated as in No. (i) above were subjected to a treatment of coal-tar and kerosene (3:1) for 20 minutes and dried. The dried twines were black in colour, very heavy and shrunk by about 2.58%.

Series (c)

The object of this series was to investigate the usefulness of tannin fixation process by oxidising agents and the utility of a subsequent treatment with coal-tar on tannin-fixed twines.

Samples of sunn-hemp twines (No. 31; 6 strands) were treated with the preservatives given below following the method indicated against each:

(i) *Cutch*.—A 5% hot solution of cutch was prepared and the twines were treated in it for about half an hour and then taken out and dried. To

ensure proper impregnation the twines were re-dyed by keeping overnight immersed in the extract. The dried dyed twines were then treated with an ammonia admixed solution of copper sulphate (CuSO_4); the strength of the copper sulphate solution being 1%. The purpose of the second treatment in the chemical reagents is "to fix" the tannin on to the twine by a process of oxidation.

(ii) *Cutch (fixed) and coal-tar*.—The twines treated with cutch by the tannin fixation process were subjected to a subsequent treatment for 20 minutes in coal-tar and kerosene (3:1) and then taken out and dried.

(iii) "*Kalagam*".—An extract (5% concentration) from the bark was prepared and the twines treated in this following the same method of fixation process explained for preservative (i).

(iv) "*Kalagam*" (*fixed*) and *coal-tar*.—The twines were treated as in item (iii) and after drying they were subjected to a treatment with coal-tar and kerosene (3:1) for 20 minutes.

(v) "*Panachikka*".—The extract from "*Panachikka*" (fruits) were prepared and the twines treated in this following the tannin fixation process by the use of the oxidising agents (CuSO_4 and NH_3).

(vi) "*Panachikka*" (*fixed*) and *coal-tar*.—The twines were treated as in item (v) and then subjected to a subsequent treatment in coal-tar and kerosene for 20 minutes.

(C) General

The dyed twines were all hung freely in shade as this facilitated not only drying, but also draining off the excess preservative. After treatment and drying, the twines were weighed to determine the percentage impregnation of the concerned preservative dye. The breaking strength of the twines prior to and after treatment were recorded both when dry and wet. The treated and untreated twines (control) were hung from frames on a bamboo raft as described by Miyamoto and Shariff (1959 a) for the continuous immersion tests.

Breaking strength of the immersed twines were being recorded at regular intervals.

The percentage impregnation of the different preservatives calculated from the mass of the twines before and after treatment is given in Table I.

TABLE I
 Showing the percentage impregnation of the preservative in the
 three series of experiments on sunn-hemp twines

Series I	Name of preservative	Percentage impregnation	Series II	Name of preservative	Percentage impregnation	Series III	Percentage impregnation		
							Before fixing	After fixing	
No. 31; 7 strands	Cutch	3.65	No. 31; 6 strands	Kalasang	3.24	No. 31; 6 strands	Cutch	5.45	4.62
	Garnol and kerosene	36.29		Panachikka	14.10		Kalasang	4.65	3.80
	Standard Green	14.44		Marstein	25.90		Panachikka	12.00	10.50
	Cuprinol	20.28		Net Life Green	11.95		Cutch and coal-tar	..	70.00
	B.C. Green	11.78		Cuminine	23.30		Kalasang and coal-tar	..	70.50
	Cuprinol	14.09		Cutch and coal-tar	78.72		Panachikka and coal-tar	66.20	64.80
	Cunilate	60.17		Kalasang and coal-tar	95.13		..	..	..

The breaking strength of the continuously immersed twines at different periods of submersion is given in Tables II to IV.

TABLE II

Showing the breaking strength of sunn-hemp twines treated with the different preservatives in experiment series (a) and under continuous immersion

Date of commencement: 10-7-1958.

Specification of twine: No. 31; 7 strands.

No. of days immersed	Breaking strength of untreated twine (control)	Breaking strength of twines treated in						
		Cutch	Garnol and kerosene	Standard Green Cuprinol	B.C. Green Cuprinol	Brown Cuprinol	Cunilate	Coal-tar and kerosene
0	25.1	16.5	26.4	31.8	28.0	24.0	13.9	26.4
3	22.8	14.4	22.4	26.3	26.3	19.0	13.5	27.0
6	13.4	8.7	17.5	26.6	25.8	17.9	13.3	28.4
9	5.7	8.0	6.5	23.6	24.5	15.5	12.2	23.3
12	3.8	3.6	5.1	21.0	20.2	13.3	9.3	18.3
15	1.6	2.1	3.8	20.0	18.0	11.0	7.7	13.8
20	0.4	0	0.6	17.2	13.7	7.3	5.0	8.3
26	0	..	0	13.4	11.7	5.2	3.5	5.4
31	..	..	..	11.8	9.4	3.9	1.3	4.0
36	..	..	..	10.3	10.2	1.9	0	2.1
41	..	..	..	7.7	7.6	0.8	..	1.8
47	..	..	..	6.3	6.0	0	..	0
54	..	..	..	5.0	3.5	..	..	..
58	..	..	..	3.4	3.3	..	..	..

DISCUSSION

That the sunn-hemp twines of Tanjore District are not uniform in thickness and twist have already been indicated by Miyamoto and Shariff (1959 *b*). The present series of tests corroborate this view. The disparity in the thickness and twist restrict the scope of comparison of breaking strength of treated and untreated twines as well as the results obtained after continuous immersion tests. However, even in this restricted tillage, certain deductions can be drawn from the present series of preservation tests.

Impregnation.—The percentage impregnation for the chemical preservatives was between 11% and 37%, that of Garnol being the maximum. The impregnation of tannin preservatives was comparatively low. In the tannin-fixed twines the percentage impregnation was less than that of their unfixed counterparts. This is explained as the action of the oxidising agent which

TABLE III

Showing the breaking strength of sunn-hemp twines treated with different preservatives in experiment series (b) and under continuous immersion

Date of commencement: 9-8-1958.

Specification of twine: No. 31; 6 strands.

No. of days immersed	Breaking strength of untreated twine (control)	Breaking strength of twines treated in						
		Kalasam	Panachikka	Marstein	Net life green	Cunimine	Cutch and coal-tar	Kalasam and coal-tar
0	17.3	18.7	19.1	15.1	17.6	13.8	15.1	23.3
3	14.5	21.9	17.9	16.0	19.5	17.3	17.8	18.1
9	4.6	5.6	8.8	16.5	18.0	16.4	16.4	20.7
14	1.6	2.0	4.4	13.0	15.5	14.2	12.5	20.7
17	0.6	1.1	4.3	8.8	12.1	13.2	12.3	16.9
23	0	0	1.5	4.6	11.1	8.6	8.9	13.2
27	..	..	1.4	2.9	5.2	7.0	6.6	13.4
32	..	..	0.7	1.7	4.4	2.8	3.2	8.9
37	..	..	0	1.5	3.3	1.4	2.8	9.6
42	..	..	..	0	3.7	2.8	3.0	6.4
47	..	..	..	..	3.6	1.5	2.6	8.0
52	..	..	..	..	2.0	1.6	3.2	6.4
58	..	..	..	..	0	3.2	2.4	6.1
65	..	..	..	..	..	2.5	2.4	6.6

TABLE IV

Showing the breaking strength of sunn-hemp twines treated with the different preservatives in experiment series (c) and under continuous immersion

Date of commencement: 7-1-1959.

Specification of twine: No. 31; 6 strands.

No. of days immersed	Breaking strength of untreated twine (control)	Breaking strength of twines treated in						
		Cutch (fixed)	Kalasam (fixed)	Panachikka (fixed)	Cutch (fixed) and coal-tar	Kalasam (fixed) and coal-tar	Panachikka (fixed) and coal-tar	Panachikka (unfixed) and coal-tar
0	20.9	20.4	22.2	24.4	16.2	17.4	20.6	20.2
5	19.6	21.5	20.1	22.5	18.1	19.5	20.6	15.6
12	13.3	22.1	20.3	23.3	13.7	21.4	19.7	16.2
20	6.1	17.2	17.2	20.5	16.9	21.9	19.8	15.1
28	3.8	12.3	16.5	10.6	17.3	17.7	19.3	10.3
35	2.2	8.1	9.1	8.6	15.3	17.4	20.2	15.4
41	1.3	3.8	6.9	4.0	12.6	20.7	15.9	10.0
49	0	1.8	1.9	2.6	11.6	16.1	15.4	9.1
56	..	0	0	2.3	7.7	14.0	14.2	7.2
62	..	..	..	0	..	14.3	9.1	5.3
70	..	..	..	..	..	9.2	8.9	5.8
78	..	..	..	..	..	9.3	7.5	4.0

makes the coating of oxidised tannin uniform and removes the excess preservative. The amount of impregnation of coal-tar was particularly high ranging between 60 and 95%. This would necessarily mean that the twines subjected to coal-tar treatment would tend to become extra heavy.

Breaking strength.—From the trends of the loss in breaking strength of the twines treated with the different preservatives in the three experimental series and as compared with the untreated twines the following deductions could be drawn:—

Chemical preservatives.—Garnol, Cunilate and Marstein were not relatively effective. This may partly be due to certain deleterious action of these preservatives on the fibre or due to the low original breaking strength of the untreated twines. Further experiments would therefore be necessary to elucidate the action of these preservatives.

B. G. Green Cuprinol and Standard Green Cuprinol and Net Life Green were effective while Brown Cuprinol and Cunimine showed comparatively satisfactory preservative qualities for sunn-hemp.

Tannin preservatives.—Exclusive tannin preservatives such as Cutch, Bark of Kalasam and "Panachikka" were not useful. The tannin-fixed twines following the Olie's (1918) method of using CuSO_4 and NH_3 were found to retain 50% of their original breaking strength for nearly 35 days.

Coal-tar treatment.—Coal-tar treatment was attempted in the following three ways:—

1. Exclusive treatment with coal-tar admixed with kerosene;
2. Coal-tar and kerosene on tannin-treated twines; and
3. Coal-tar and kerosene on tannin-fixed twines.

All the three methods were found to be useful in preserving sunn-hemp twines, the latter two being comparatively effective.

SUMMARY

The details of the preliminary studies conducted for the preservation of sunn-hemp twines are presented. The relative utility of the preservatives tried are discussed.

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