

ON THE EFFICACY OF INDIGENOUS METHOD EMPLOYED ALONG GOA
COAST FOR PROTECTING FISHING CRAFT AGAINST
BIODETERIORATION

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ABSTRACT

An indigenous formulation, comprising 'chandrus' and lime in Karanjel oil, used by the fishermen of Goa to protect their boats from marine wood-borers and foulers has been described. Results of experiments using wooden test panels treated with this composition and coated with cashewnut shell oil clearly indicate that the method has no particular efficacy to prevent biodeterioration. It is suggested that the reduced rate of destruction of boats treated by this method may be due to the frequency of application coupled with the detrimental effect of regular drying of boats on larvae during low tide or when beached after each fishing operation.

Key words : Protection of boats, fishing craft, biodeterioration.

INTRODUCTION

The problem of marine wood-boring and fouling organisms is of great economic importance to the fishing industry in developing countries where wood is extensively used as a constructional material for fishing craft. The fishermen in India have evolved several methods to contain the hazards of marine borers and foulers in order to protect the hulls of their fishing boats. Crude fish oil (sardine oil and shark liver oil), cashewnut shell oil (*Anacardium occidentale*), poon seed oil (*Calophyllum* spp., also called hunnai oil or undi oil), neem seed oil (*Melia* spp.), crude engine oil, red-ochre, lime plaster, animal fat, plant resin and vegetable tannins, castor oil, groundnut oil, coal tar and Karanjel oil (*Pongamia pinnata*) are all used, either alone or in combination by the Indian fishermen for applying to underwater surfaces of their boats (John and Cheriyan, 1964; Balasubramanyan, 1964; Santhakumaran and Jain, 1982).

During a survey on the indigenous protective methods followed along the Goa coast, it was found that a special formulation with "chandrus" (a plant resin mostly from members of the family Dipterocarpaceae), lime and Karanjel oil has been com-

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Fig. 1. Condition of the panels of Experiment II after 337 days; A : treated with 'chandrus' and lime in karanjel oil, B : treated with 'chandrus', lime and copper sulphate in karanjel oil; C : untreated control.

monly used by the fishermen. Experiments were therefore, conducted to study the effectiveness of this method against settlement of marine organisms and results obtained from treated wooden panels have been presented in this paper.

MATERIAL AND METHOD

The preservative composition was prepared as per the procedure practiced by the fishermen. 'Chandrus' was finely powdered and cooked in Karanjel oil in the ratio 1 : 4, till it was completely dissolved. To this, finely powdered lime was slowly added while still hot and pounded well with a heavy blunt log till a paste was formed to the required consistency. The thin paste was then applied to the test panels while it was mildly warm using a stick with a clothed end. When the surface was dry, a final coat with cashewnut shell oil was given. In another treatment, panels were coated with the same composition but to which finely powdered 5% copper sulphate was added to ascertain whether the efficacy of the indigenous composition could be so enhanced. Three panels each were used for both the treatments and two series of experiments were conducted. In experiment I, treated panels of *Acrocarpus fraxinifolius*, *Pinus roxburghii*, *Terminalia alata* and *Calophyllum elatum* of 30 cm X 2.8 cm X 2.8 cm size, were exposed from 13-1-1981 to 30-3-1981 along with untreated controls. The treatment with the paste containing copper sulphate was done only on panels of *A. fraxinifolius*. In experiment II, panels of *Mangifera indica*, of 15 cm X 10 cm X 2.5 cm were treated and exposed from 28-5-1981 to 30-4-1982. Exposure

trials were conducted at Betim near Panaji in the Mandovi estuary. Periodical observations on the incidence of borers (number of entry holes) and foulers (approximate surface area covered) were recorded.

RESULTS AND DISCUSSION

Condition of the panels of experiment I after 76 days and of experiment II after 166 and 337 days has been presented in Table I. From the results it is evident that the treatment with the indigenous formulation does not impart any appreciable degree of protection to the panels, as all of them indicate heavy fouling settlement and incidence of large number of huge wood-borers within a period of 2½ months. However, during the initial stages, the treated panels harboured fewer borers than the untreated controls, which were all completely destroyed within 5½ months (Table I) (Even the borers on treated panels had grown to very large size causing considerable damage). But this apparent advantage was lost on prolonged exposure and by the end of one year, the treated panels also were found severely damaged (Fig. 1). It was also found that the coating has very poor adhesion to the panel surfaces and it was washed off easily in patches exposing timber thereby facilitating borer infestation. This perhaps explains the subsequent loss in the beneficial effect of treatment. The effect of coating on the settlement of foulers also follows the same pattern but with some advantage. For example, on panels of experiment I, heavy fouling can be observed on the treated surface compared to the fouling intensity on panels of experiment II, despite the longer duration of exposure of the latter ones. A possible explanation for this may be that, due to longer duration of immersion, panels of experiment II were subjected to more wave action thereby washing off the protective coating, resulting in an unstable substratum. Hence, the settled foulers also disappear when the coating itself peels off. However, towards the end of the experiment the panels became much riddled and brittle offering no hard substratum for the foulers. It has been observed during routine inspections that foulers like barnacles, serpulids and bivalves, which normally get firmly cemented to the substratum, have very loose attachment and could be easily dislodged from the coating.

The wood-borers encountered on the panels, in the order of decreasing intensity were *Martesia striata* (Linnaeus), *Lyrodus pedicellatus* (Quatrefages) and *Nausitora hedleyi* Schepman. Stray specimens of *Dicyathifer manni* (Wright) were also noticed. Among foulers, the most dominant groups were barnacles, followed by hydroids, bryozoans, serpulids and bivalves.

From the results presented, it is clear that the indigenous method, described above has no particular efficacy for the purpose it is used. Nevertheless, the practice is extensively followed by the fishermen in Goa, claiming that it is effective. It may be that the borer attack may not be as serious on indigenously protected boats as it is on treated test panels. Because, while test panels are permanently exposed in the sea for the continued onslaught of borers, the smaller boats are beached after day-to-day fishing. Hulls of bigger boats also are periodically exposed during low tides. This rhythmically repeated drying may kill the larvae of borers settled on the hulls, thereby limiting the extent of destruction. Again the apparent effectiveness of the method can also be traced to the frequency of application especially of cashew nut shell oil which is profusely applied several times during the fishing season. In spite

Table I

Incidence of wood-borers and foulers on panels of experiments I and II exposed at Betim
A. Experiment I (13-1-1981 to 30-3-1981):

Timber species	Treatment	*Observation on 30-3-81		Remarks
		Number of borers	Area covered by foulers %	
<i>Acrocarpus fraxinifolius</i>	'Chandrus' and lime in Karanjel oil.	21	75	All the borers, mainly <i>Martesia striata</i> , have grown to huge size in all the panels. Coating washed off in patches.
<i>Pinus roxburghii</i>	—do—	32	70	
<i>Terminalia alata</i>	—do—	13	80	
<i>Calophyllum elatum</i>	—do—	18	80	
<i>Acrocarpus fraxinifolius</i>	'Chandrus', lime and copper sulphate in Karanjel oil.	16	80	
Control panels	nil	Badly destroyed by numerous borers and also heavily fouled.		28-4-1981.

B. Experiment II (28-5-1981 to 30-4-1982):

Timber species	Treatment	*Observations on				Remarks
		10-11-1981		30-4-1982		
		No. of borers	Area covered by foulers (%)	No. of borers	Area covered by foulers (%)	
<i>Mangifera indica</i>	'Chandrus' and lime in Karanjel oil.	32	25	Completely destroyed and brittle.	—do—	Huge borers, mostly <i>Martesia striata</i> , in all the panels. Coating almost washed off by 10-11-1981.
—do—	'Chandrus' lime and copper sulphate in Karanjel oil.	42	40			
Control panels	nil	Completely destroyed and brittle		—		

* Average of 3 panels.

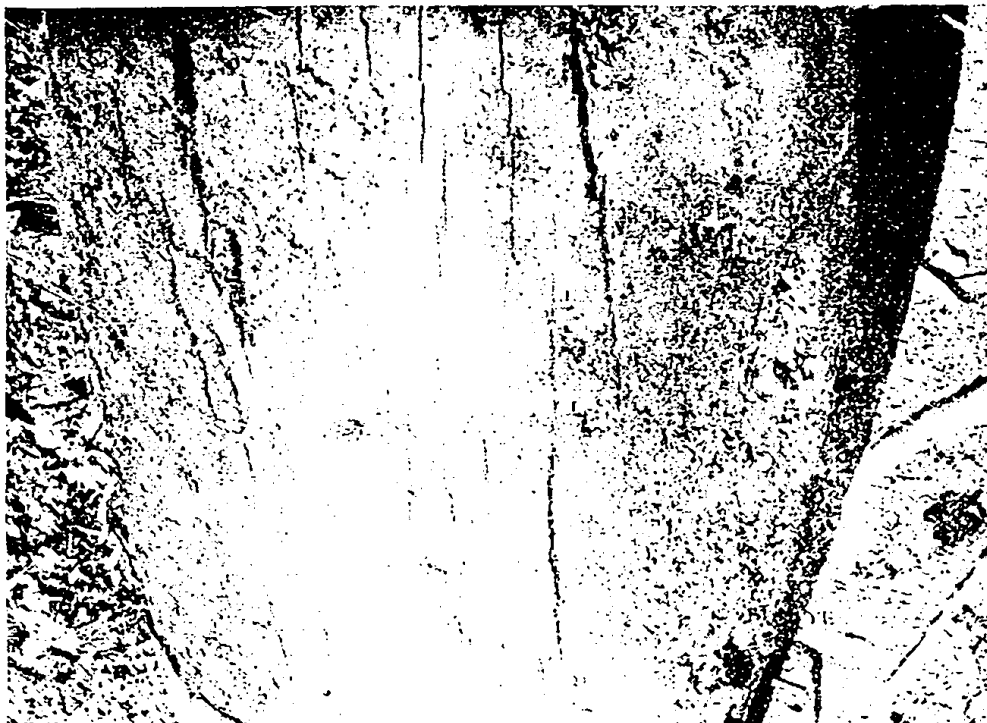


Fig. 2. Bottom of a country canoe heavily damaged by marine wood-borers.

of all these measures, destruction of wooden fishing craft along Goa coast by borers is very serious and examination of large number of boats at Colva and Betim indicates serious damage to the hull, especially by *M. striata* and *N. hedleyi* (Fig. 2).

It may be mentioned here that Balasubramanyan (1964) also conducted a series of investigations using test panels to assess the protective value of various indigenous preservatives against marine organisms and reported that the indigenous preparations were ineffective.

The cost of application of the coating described above is about Rs. 20/- per m². The labour charges for hauling up on the beach and refloating a large-sized boat will amount to Rs. 1,000/- to Rs. 1,500/- for each operation. It has been estimated that the annual expenditure incurred on a fishing craft for controlling the attack of marine borers and foulers is about Rs. 300/- per non-mechanised boat and Rs. 4,000/- per bigger mechanised boat (Santhakumaran and Jain, 1982). There are about 4500 indigenous and 387 mechanised boats (P. V. Doiphode, personal communication) operating along Goa coast and thus, a very conservative estimate would put the total annual loss involved to the tune of about 2.9 million rupees. Therefore, any improvement in the efficiency of traditional protective measures would make a very significant contribution to the economic operation of the fishing industry, curtailing considerable expenditure on maintenance of boats, much to the relief of the poor fishermen of Goa.

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