

Fungal Decay of Traditional Fishing Craft

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The artisanal fishermen land major portion of fish caught in India, employing traditional fishing craft and methods. These craft are built of indigenous wood and undergo rapid biodeterioration causing great economic loss. Soft-rot fungi with their filamentous structure, specialized enzyme systems and ability to withstand periodic wetting and drying of the craft are the principal agents of this biodeterioration. The paper highlights the work carried out on this aspect in India, the fungi involved, their role in the biodeterioration process, traditional and modern preventive methods, their economics with suggestions for future work. This study becomes important in view of the fishing industry turning towards traditional fishing craft for low energy fishing, due to economic strains.

In India 60 to 70% of marine fish catches are landed by traditional craft. The wood of the crafts undergo quick decay due to biodeterioration. The filamentous structure of the soft rot fungi with their specialized enzyme systems penetrate deep inside the wood cells and bring about deterioration and decay. The decayed parts have to be periodically repaired and replaced causing great economic loss to the fishermen. The traditional fishermen use traditional preservatives made from indigenous materials which give only little protection to the craft. Although this problem has been identified, economics estimated, some work on the preservatives reported, yet a thorough and systematic study is essential in view of the importance of these crafts in low energy fishing practices.

Materials and Methods

Studies undertaken by different workers on the incidence of fungi, consequent process of biodeterioration of wood, method adopted to arrest the evaluation procedure are reviewed. The investment on fishing craft and annual losses on account of biodeterioration are cited to prevent the economic loss.

Results and discussion

The Fungi

The soft-rot fungi belong to Ascomycetes and Fungi imperfecti. They are of two

types first cellulolytic fungi producing cellulolytic enzymes, degrading cellulosic contents of the wood cells and the second the lignicolous or lignolytic fungi which produces lignolytic enzymes degrading the lignin contents of the secondary thickening of the wood cell wall. The filamentous structure of these fungi help their efficient penetration into the tracheid cells of the wood where some moisture remains during the periodic drying of the craft. The other marine organisms fail to survive in such conditions.

The biodeterioration process of the fungi

The fungal hyphae grow first into the lumina of the wood cells, then pass through the tertiary wall and grow into the less lignified middle layer of the secondary cell wall. The hyphae of the cellulolytic fungi follow the orientation of the cellulose microfibrils thereby forming characteristically arranged elongated chains of cavities with conical ends within the wall. The lignicolous fungi degrade the lignin part of the wood cells. The mucilagenous sheath around the fungal hyphae are the carrier of the extracellular enzymes (cellulolytic and lignolytic). The actively moving hyphae within the wood cell wall cavity, serve to facilitate the movement of these extracellular enzymes from the

hyphae to the wood cell substrate (Leightley & Eaton, 1977).

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The cause of decay was by "Soft-rot fungi" belonging to Ascomycetes and Fungi imperfecti which can survive rhythmic wetting and drying of these crafts, by penetrating deep into the vessel of the wood and decaying their inner layers. Reports are available on the marine fungi isolated from the wooden logs and wooden panels immersed in marine environment of the western and eastern coasts of India, Kohlmeyer *et al.* (1967), Jones (1983), Raghukumar (1973). Nair (1968) reported five wood infecting marine fungi from Cochin harbour. Ranu Gupta & Ravindran (1988) isolated the wood decaying fungi from traditional craft and tested them by accelerated fungal decay test. Mechanical strength loss of the wood blocks were estimated through compression stress test. The results indicate that fungal decay did bring about loss of mechanical strength of wood and the traditional preservatives gave marginal protection.

Wood preservatives

These preservatives can be divided into two categories, first the traditional wood preservatives made from the indigenous products in different combinations and the second one is the chemicals used in different combinations as wood preservatives.

Traditional wood preservatives

Used in different combinations of the following products:

Crude fish oil	Animal fat
Cashewnut shell oil	Castor oil
Poon seed oil	Ground nut oil
Neem seed oil	Coal tar
Crude engine oil	Karanjal oil
Red ochre	"Chandrus"
Lime plaster	

(L.N.Santhakumaran & J. C. Jain, 1982)

Chemicals used as wood preservatives

They are also used in different combinations.

Major use wood preservatives

1. Pentachlorophenol
2. Creosote
3. Inorganic salt
 - a) Ammoniacal copper arsenate (ACA)
 - b) Chromated copper arsenate (CCA)
 - c) Acid copper chromate (ACC)
 - d) Chromated zinc chloride

Minor use wood preservatives

1. Copper naphthanate
2. Copper-8-quinolinolate
3. Tributyl tin oxide
4. Alkyl ammonium compounds (AAC)
(Darrel, D. Nicholas & Alan F. Preston, 1986)

Preventive treatment

Rao *et al.* (1981), Tewari *et al.* (1984) have studied the extent of retention of copper-chrome arsenic preservative in two katamarans in actual service on the eastern coast of India. The results show that even after 10 years of service CCA was retained in some quantities, and this shows good promise as a preservative. On the western coast of India Nair *et al.* (1982) and Ravindran *et al.* (1984) have been working on the improved chemical preservative treatments for these country crafts with "copper creosote" and "creoscor" innovated by CIFT, Cochin.

With the increase of pollution consciousness the studies have been directed towards biodegradation of residual biocides in the environment.

Brisco *et al.* (1990) concluded that the modern trend towards more environmentally acceptable biodegradable biocides might be expected to exacerbate such problems since such preservatives are likely

to be more susceptible to biodegradation than traditional persistent formulations.

Economics

In 1958, Becker & Kohlmeyer conducted the first study in India on deterioration of wood by marine fungi and its special significance to fishing craft. The annual loss in replacement of decayed parts was reported to be Rs.2.5 million. According to a recent estimate by Ravindran *et al.* (1984), the investment in traditional fishing craft in Kerala is about Rs.297 millions and in all India Rs.600 million.

Suggestions

A detailed systematic study should be undertaken on the fungal decay of the traditional fishing craft at different areas along the Indian coast.

The causative organisms to be studied in detail and the efficacy of different preservatives may be tried out in in-vitro studies and the promising ones may be tested under natural conditions and standardized.

Combinations of traditional preservatives with chemical preservatives having high efficacy may be tried out which may prove an environmentally more acceptable biodegradable biocide.

Till the alternative material of wood is introduced, widely accepted and brought into regular use, fungal decay of traditional fishing craft will continue to be an important economic problem for the low energy fishing practices.

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