

Antifouling property of the fruits of *Randia brandisii* (Rubiaceae) and *Sapindus trifoliatus* (Sapindaceae)

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Methanol extracts of fruits of *Randia brandisii* (Gamble) and *Sapindus trifoliatus* (Vahl) were assessed for marine antifouling properties. The coatings of these crude extracts on aluminium coupons were found to inhibit settlement of macrofoulers in estuarine water and bacterial foulers in laboratory.

Many attempts were made to find out suitable compounds that could prevent marine growth effectively. These compounds include various chemicals¹ as well as bioactive substances of certain marine organisms^{2,3}. Presently fouling is controlled with synthetic paints containing inorganic copper and organotin compounds, but these toxins pose long-term pollution hazards in inland waters⁴⁻⁶. Natural products however, being biodegradable show restricted toxicity. In the present investigation crude methanol extracts of fruits of two terrestrial plants, *Randia brandisii* (Dicotyledonae, Rubiaceae) and *Sapindus trifoliatus* (Dicotyledonae, Sapindaceae) were used for assessing their possible antifouling properties.

The fruits of *R. brandisii* and *S. trifoliatus* were extracted with methanol and concentrated under reduced pressure. The concentrated extract was mixed with paint containing alkyd as binder (paint: extract ratio 2:1 w/w) and applied on aluminium panels (10 × 8 × 0.2 cm). The painted panels were suspended in estuarine water to study settlement of fouling organisms. Panels coated with paint alone (without extract) were exposed as controls. The panels with and without extracts were studied in replicate (4 plates).

Fortnightly visual observations were made. During the first 15 d moderate growth of hydroids was observed on the control panels whereas, the panels treated with extracts were free from any growth. At the end of 45 d, dense settlement of barnacles (*Balanus amphitrite*) was observed on control panels (Fig. 1C). On the other hand the panels treated with

extracts were free from fouling up to 45 d. During subsequent observations at the end of 60 d, few colonies of encrusting bryozoans (*Membranipora* sp.) and barnacles settled on panels treated with

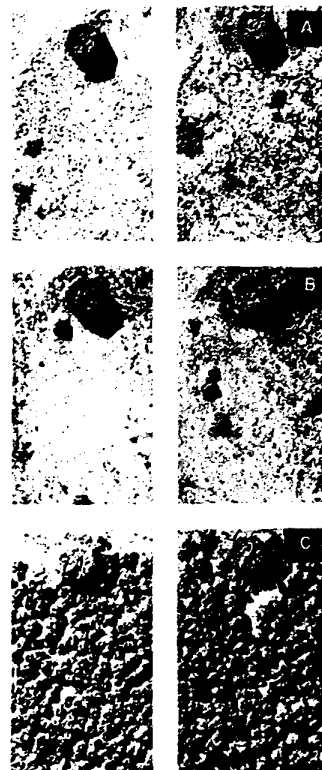


Fig. 1—Painted panels (in replicates) after 60 d exposure to seawater; A—paint with extract of *Sapindus trifoliatus*, B—paint with extract of *Randia brandisii*, C—control-non toxic paint

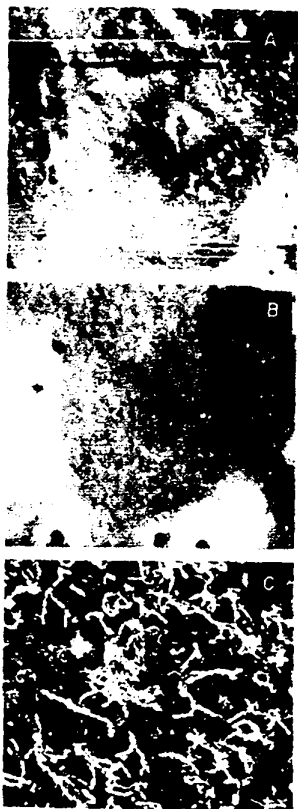


Fig. 2—Scanning electron micrographs (800 ×) showing the extent of bacterial growth on stubs coated with: A—paint with extract of *Sapindus trifoliatus*, B—paint with extract of *Randia brandisii*, C—control-non toxic paint

extracts (Fig. 1A, B). It is therefore evident that the crude extracts were effective in controlling marine fouling for a short period (45 d). After 45 d probably the toxic ingredients of the coating was expended, thereby allowing the organisms to settle. In another experiment, the extracts were tested for their toxic properties towards bacteria. Aluminium stubs were coated with paint-extract mixture in the same way as that of panels and suspended in flasks containing fouling bacterial culture (*Vibrio* sp). The stubs were examined under SEM after 48 h exposure to the broth culture. The results showed dense growth of filamentous bacteria on control stubs (Fig. 2C) whereas, no growth was observed on the stubs with crude extracts (Fig. 2A, B).

It is evident that certain substances from the crude extracts of *R. brandisii* and *S. trifoliatus* were inhibitors of settlement of macro as well as microorganisms.

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References

- 1 Anon, *Marine fouling and its prevention*, (Woods Hole Oceanographic Institute, USA) 1952, pp 241.
- 2 Al-Ogil S M & Knight-Jones E W, *Nature Lond*, 265 (1977) 728.
- 3 Sieburth J McN & Conover J T, *Nature Lond*, 208 (1965) 52.
- 4 Hoare R & Hiscock K, *Estuar Coast Mar Sci*, 2 (1974) 329.
- 5 Fingerman S W, in *Marine biodeterioration*, edited by M F Thompson, R Sarojini & R Nagabhushanam, (Oxford & IBH Publ Co, New Delhi) 1988, 781.
- 6 Hunter J E & Evans L V, *Biofouling*, 2 (1990) 267.