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Biological Activity of Some Marine Algal Extracts

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Extracts of some marine algal strains representing Chlorophyta and Rhodophyta, from Vishakapatnam, were screened for antibacterial activity and for their ability to inactivate the enzyme penicillinase *in vitro*. *Staphylococcus aureus* was more sensitive to these extracts than *Escherichia coli*. There was no appreciable effect on inactivation of penicillinase except by *Ulva faciata* which inhibited 10% activity.

Extracts of marine algae were reported to exhibit antibacterial activity[1,2]. In the present study antibacterial activity of some marine algae was studied along with their ability to inactivate penicillinase enzyme *in vitro*.

Seven species of algae were collected from Vishakapatnam Coast during May 1981. They were Chlorophyta: *Chaetomorpha antennina* (Bory.) Kuetz, *Ulva fasciata* Delile, *Spongomorpha indica* Thivy *et* Visalakshmi, *Caulerpa fastigiata* (Mont.), and Rhodophyta: *Gelidium pusillum* (Stackh) LeJol., *Gracilaria corticata* J Ag., *Hypnea valentia* (Turn) Mont.. These algae were air dried, and powdered. Each of these species was successively extracted by the conventional procedure with petroleum ether (60-80°C), chloroform and methanol (in hot conditions). The solvents were removed under reduced pressure to yield semi solids.

Escherichia coli and *Staphylococcus aureus* were employed for determining the antibacterial activity of the extracts. Pen-assay broth and nutrient agar (HI-media) were employed and *p*H of the medium was adjusted to 7.6. Stock solutions of extracts were prepared in 20% acetone or 1% DMSO as the case may be and filtered through millipore filter (pore size 0.45 μm). The extracts were tested for antibacterial activity by test tube dilution assay[3] and minimum inhibitory concentration (MIC) was noted.

The *in vitro* inactivation of penicillinase was studied by modified rapid iodometric method[4]. The enzyme penicillinase and penicillin (1660 U.mg^{-1}) were obtained from Hindustan Antibiotics Ltd, Pune. The method is based on the enzymic decomposition of active penicillin to inactive penicilloic acid which is known to react stoichiometrically with iodine to give a colourless compound thus decolourizing iodine. The time taken for decolourization of the treated (test) and untreated (control) enzyme is noted and the percentage of inactivation is calculated from the standard chart[4]. The effect of the extract was studied at different time intervals on penicillinase at 30°C at 1 μg conc. of extract per unit of penicillinase. Appropriate positive, negative, DMSO and acetone controls, were maintained.

In the present study, the marine algal extracts exhibited moderate antibacterial activity. MIC values of petroleum ether extracts of all algae were $\geq$200 μg.ml^{-1} against *E. coli* and *S. aureus*. Similarly, methanol extracts exhibited MIC values above 200 μg.ml^{-1} except extracts of *C. fasciata* and *S. indica* where the MIC was 200 and 100 μg.ml^{-1} respectively against *S. aureus* only.

The chloroform extracts of *C. antennina* exhibited MIC of 200 and 100 μg.ml^{-1} against *E. coli* and *S. aureus* respectively. All other chloroform extracts showed MIC of 200 μg.ml^{-1} and above. Thus chloroform extract of *C. antennina* had more antibacterial activity than other extracts.

No marked loss of penicillinase activity was observed when this enzyme was pretreated with each of the algal extracts for various lengths of time. However, chloroform extract of *U. fasciata* inhibited 10% of the penicillinase activity within 10 min. The percentage of inhibition of enzyme activity was measured against a control reaction where the extract was replaced by respective solvent in the sample tube.

It may be concluded that chloroform extracts appeared to possess more antibacterial and penicillinase inactivating ability than petroleum ether and methanol extracts. Similar to present findings, extracts of Chlorophyta have been reported to be more antibacterial than Rhodophyta[2,5-10].

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