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Screening of Marine Actinomycetes from Coastal Regions of Tamil Nadu

KEYWORDS: Screening, Marine actinomycetes, Tamil Nadu

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ABSTRACT *Ocean has been considered as a rich source of bioactive compounds having novel structures and biological activities. Actinomycetes are well known for its ability to produce antibiotics. They are gram positive bacteria that consist of a group of branching unicellular microorganisms with high GC content. A study on antibacterial effect of marine actinomycetes against bacterial pathogens was carried out during June 2012 to December 2012. Fourteen different locations of coastal area were selected for sampling. Totally 391 actinomycetes were isolated from the marine soil samples of Tamil Nadu. The antibacterial screening of actinomycetes was checked in modified nutrient agar medium against Bacillus subtilis, Enterobacter sp., Escherichia coli, Proteus sp., Pseudomonas syringae and Pseudomonas aeruginosa. The antibacterial screening showed that, 245 actinomycetes exhibited antibacterial activity against the bacterial pathogens. Thus the result of antibacterial screening represents that the coastal areas of Tamil Nadu are rich in antibacterial antibiotics produced by actinomycetes.*

Introduction:
Actinomycetes play a vital part among the marine bacterial communities, because of its diversity and ability to produce new bioactive compounds of high profitable price (Suthindhiran and Kannabiran, 2009; Amador et al., 2003; Hopwood 2007; Imada 2005). Marine microorganisms are more attractive than other sources because they are not extensively studied as their terrestrial counterparts. Great potency is required for bioactive compounds to be effective in the marine environment, due to the diluting effect of seawater (Kumar Saurav and Kannabiran 2010). The diversity of living organisms in the terrestrial environment is astonishing, but the greatest biodiversity occurs in the sea (Donia and Hamann 2003). It is predicted that less than 1% of potentially beneficial compounds from marine environment has been screened so far, with microbial products of approximately 1% of the total number (Neidleman and Laskin 2000). So the present investigation was designed for the isolation and screening of marine actinomycetes from selected coastal regions of Tamil Nadu for its antibacterial potential.

Methodology:
The marine soil samples were collected from fourteen different locations of Tamil Nadu, India namely, Chennai (13003'02.05'' N and 80016'58.81'' E), Mahabalipuram (12036'43.64'' N and 80011'48.92'' E), Cuddalore (11044'24.08'' N and 79047'11.68''E), Nagore (10048'49.23''N and 79051'04.98'' E), Velankanni (10040'52.03''N and 79051'12.85''E), Kodiyakarai (10016'59.55''N and 79049'56.15''E), Rameshwaram (9016'38.30''N and 79018'57.77''E) Tuticorin (8043'31.97'' N and 78009'21.70'' E), Tiruchendur (8029'46.36'' N and 78007'46.24'' E), Kulasekarapattinam (8023'44.97'' N and 78003'30.95''E), Uvari (8016'31.67'' N and 77053'26.22''E), Kudankulam (8009'26.59''N and 77038'28.44'' E), Kanyakumari (8004'38.73'' N and 77033'04.35'' E) and Medalam (8012'09.69'' N and 77012'54.95'' E). The sediment samples were brown in colour and of sandy texture.

Isolation of actinomycetes was carried out by serial dilution and spread plate technique (Collins et al., 1989) in Starch Casein agar and Kuster's agar medium supplemented with 100µg/ml cyclohexamide. The plates were incubated for 15 days at 25^{0}C. The isolated actinomycetes were purified by quadrant streaking method and were maintained in ISP2 agar medium by storage at 8^{0}C for 2 months.

Antibacterial activity of the pure isolates was tested by cross streak method (Lemos et al., 1985) on Modified Nutrient agar plates. The actinomycete isolates were streaked in the center of the plate as a single streak. After incubation at 250C for 5 days, 24 hours cultures of *Bacillus subtilis, Enterobacter* sp., *Escherichia coli, Proteus* sp., *Pseudomonas syringae* and *Pseudomonas aeruginosa* were streaked perpendiculars to the central strip of actinomycetes culture. All plates were again incubated at 37^{0}C for 24 hours and the results were noted. The standard cultures were collected from Department of Microbiology, Lady Doak College, Madurai, India and Bacillus subtilis were obtained from MTCC, Chandigarh, India.

Results and Discussion:
The selection of potent antagonistic actinomycetes was based upon the vast diversity of isolates and sampling size (Sundaram Ravikumar et al., 2010). Totally three hundred and ninety one different actinomycetes have been isolated from the soil samples of coastal areas of Tamil Nadu. The isolation of actinomycetes from diverse microflora that exist in nature is complexed by their distinctive slow growth when compared to that of other bacteria (Kokare et al., 2004; Kerkar, 1994; Hirsch and Christensen, 1983).

The screening of marine actinomycetes was done to detect its antibiotic production. The inability of the tested bacteria to grow in the presence of actinomycete represented the antibiotic production by marine actinomycetes. All the actinomycetes were tested against six bacterial pathogens by cross streak method. The results revealed that, 245 actinomycetes strains showed antagonistic activity against atleast one bacterial pathogen. The percentage of the active actinomycete isolates were 62.66%. Among the bacterial pathogens, *E.coli* was very sensitive to the marine actinomycetes when compared to other bacteria and it was followed by *B. subtilis*. The result of the screening of marine actinomycetes which inhibit bacterial pathogens was tabulated in Table 1. The number of marine actinomycetes inhibiting the bacterial pathogens by cross streak method was shown in a Pie chart (Figure 1) and the petriplates showing the inhibition of bacteria by marine actinomycetes was shown Plate1.

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Table1: Screening of marine actinomycetes

Location	*E.coli*	*Enterobacter sp.*	*Bacillus subtilis*	*Proteus sp.*	*Pseudomonas aeruginosa*	*Pseudomonas syringae*
Tuticorin	8	7	2	5	4	4
Uvari	9	8	9	9	9	10
Medalam	3	11	7	3	3	1
Tiruchendur	6	5	5	7	3	6
Kanyakumari	0	1	3	0	1	1
Nagore	2	6	8	3	4	1
Velankanni	6	4	5	11	7	4
Chennai	7	11	7	5	7	5
Mahabalipuram	24	3	13	5	12	17
Kodiyakarai	2	2	2	3	1	2
Kulasekarapattinam	4	2	3	1	2	1
Kudankulam	5	5	5	1	2	2
Rameshwaram	8	2	7	0	5	2
Cuddalore	5	0	5	1	3	0

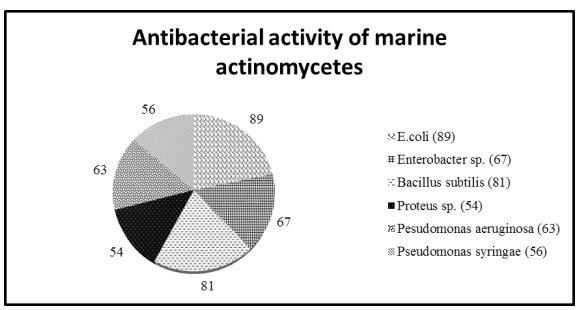

Figure 1: Pie chart showing the number of marine actinomycetes inhibiting the bacterial pathogens by cross streak method

Plate 1: Antagonistic activity of marine actinomycetes isolate Tir12 against bacterial pathogens by cross streak method

Conclusion:

The present study revealed that, many actinomycetes were found in Tamil Nadu coastal areas with significant antibacterial activity against the bacterial pathogens. The development of suitable fermentation and downstream processing technologies may lead to the production of new classes of antibiotics.

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