CHAPTER 7

EVALUATION OF THE INFLUENCE OF CULTURE FILTRATES ON BACTERIA
7.1: INTRODUCTION

The effect of the culture filtrates of the 12 marine cyanobacterial species on the growth of four clinical and four non-clinical strains viz.,

Clinical strains:
1. *Escherichia coli*  
2. *Pseudomonas aeruginosa*  
3. *Proteus* sp.  
4. *Staphylococcus aureus*

Non-clinical strains:
5. *Escherichia coli*  
6. *Pseudomonas aeruginosa*  
7. *Staphylococcus aureus*  
7. *Bacillus* sp.

was tested. Culture filtrates of microalgae in general and cyanobacteria in particular are known to contain a variety of substances, some of which could be toxins and some of which could be growth promoting (Stein and Borden, 1984) Evaluation of the effect of culture filtrates could therefore prove useful in identifying such activity and using the same for different applications.

7.2: MATERIALS AND METHODS

To study the effect of culture filtrate on bacteria, 30 days old cyanobacterial suspensions were centrifuged and supernatants were filtered through a millipore membrane (0.2μ porosity) and preserved aseptically.
One mL of filtrate was added to each tube containing 5 mL of sterilized nutrient broth medium followed by 50 uL of seed inoculum was added. They were kept in the incubator at 37°C for 24 hours, tubes were shaken well and absorbancy was measured at 540 nm in Spectrophotometer. The measured absorbancy was subtracted from the absorbancy of individual bacterial control and the results were expressed in percentage.

7.3: RESULTS AND DISCUSSION

Of the culture filtrates tested, those of S. subsalsa BDU 30311, P. valderianum BDU 20571, P. corium BDU 30241 and Pl. terebrans BDU 30342 promoted the growth of most of the bacteria; those of O. salina BDU 10142, O. formosa BDU 40261, P. angustissimum BDU 40061 and Ps. schmidlei BDU 30313 inhibited the growth of the majority of bacteria, while those of the remaining species either promoted or inhibited the growth depending on the bacterial strains (Figs-7 A to L). The culture filtrate of Pl. terebrans BDU 30342 strikingly promoted with the growth of almost all the bacterial strains tested except Pseudomonas aeruginosa (Fig-7 J). This could probably be due to the presence of some vitamins, or other growth promoting substances and also the absence of inhibitory compounds. The culture filtrate of P. valderianum BDU 20571 and P. corium BDU 30241 proved to be growth promotive to almost all the strains except two pathogenic bacteria (Figs-7 E and G). Interestingly, wherever growth inhibition was observed they were mostly pathogenic strains and wherever growth promotion was observed were
Influence of marine cyanobacterial culture filtrates on the growth of bacteria

Clinical strains

1. *Escherichia coli*
2. *Pseudomonas aeruginosa*
3. *Proteus sp.*
4. *Staphylococcus aureus*

Non-clinical strains

5. *Escherichia coli*
6. *Pseudomonas aeruginosa*
7. *Staphylococcus aureus*
8. *Bacillus sp.*
FIG-7: INFLUENCE OF MARINE CYANOBACTERIAL CULTURE FILTRATES ON THE GROWTH OF BACTERIA

SYNECHOCOCUS ELONGATUS

% OF GROWTH COMPARED WITH CONTROL

BACTERIAL STRAINS

SPIRULINA SUBSALSA

% OF GROWTH COMPARED WITH CONTROL

BACTERIAL STRAINS

OSCILLATORIA SALINA

% OF GROWTH COMPARED WITH CONTROL

BACTERIAL STRAINS

OSCILLATORIA FORMOSA

% OF GROWTH COMPARED WITH CONTROL

BACTERIAL STRAINS

...(Contd.)
FIG-7: INFLUENCE OF MARINE CYANOBACTERIAL CULTURE FILTRATES ON THE GROWTH OF BACTERIA

**PHORMIDUM VALDERIANUM**

% OF GROWTH COMPARED WITH CONTROL

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**PHORMIDUM ANGUSTISSIMUM**

% OF GROWTH COMPARED WITH CONTROL

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**PHORMIDUM CORIUM**

% OF GROWTH COMPARED WITH CONTROL

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**PHORMIDUM TENUE**

% OF GROWTH COMPARED WITH CONTROL

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FIG-7: INFLUENCE OF MARINE CYANOBACTERIAL CULTURE FILTRATES ON THE GROWTH OF BACTERIA

LYNGBYA SP.

% OF GROWTH COMPARED WITH CONTROL

PLECTONEMA TEREBRANS

% OF GROWTH COMPARED WITH CONTROL

PSEUDANABAENA SCHMIDLEI

% OF GROWTH COMPARED WITH CONTROL

DICHOThRIX BAUERIANA

% OF GROWTH COMPARED WITH CONTROL
mostly non-pathogenic strains (Fig-7). The culture filtrates of *P. angustissimum* BDU 40061 and *Ps. schmidlet* BDU 30313 probably contained either a large number of or fairly higher concentrations of antibacterial substance(s) and hence inhibited the growth of the majority of bacterial strains tested (Figs-7 F and K). So far, there is no report in literature on both the positive as well as the negative effects of cyanobacterial culture filtrates on bacterial growth. The results warrant further work on the identification of compounds involved promotion and in inhibition of bacterial growth and the probable mechanisms.

### CONCLUSIONS

1. The effect of cyanobacterial culture filtrates on bacterial growth could be highly varied.

2. Culture filtrates of *S. subsalsa* BDU 30311, *Pl. terebrans* BDU 30342, *P. valderianum* BDU 20571, and *P. corium* BDU 30241 could be useful for increasing biomass production of useful bacteria and could also help increasing soil fertility by promoting the growth of heterotrophic nitrogen fixers and other beneficial bacteria.

3. Culture filtrates of *O. salina* BDU 10142, *O. formosa* BDU 40261, *P. angustissimum* BDU 40061 and *Ps. schmidlet* BDU 30313, could be used for controlling bacterial population wherever they are needed and they could also be tried as sprays for decontamination.