PREFACE

Man is becoming more and more concerned about his surroundings. One main reason for this is the increasing threat to the health and cleanliness of the environment on account of pollution from manifold sources. Environmental pollution is a global phenomenon causing, in many instances, rather permanent damages to the aerial, terrestrial and aquatic environments. The pollution has acquired such dimensions that the very existence of life on earth is threatened. The release into the nature, of various kinds of chemicals in the form of solids, liquids and gases is an ever increasing problem and efforts are being made all over the world, especially by the developed nations to combat it on a war footing. However due to various reasons the developing or underdeveloped countries are not able to properly conceive the seriousness of the problem and fight against it.

In India also the problems of pollution are acquiring serious dimensions. One major area which is highly threatened is the aquatic environment, both fresh water and marine which houses myriads of living organisms especially the green matter or the phytoplankton which form the basis of all aquatic life. Large quantities of several biocides in the form of insecticides, fungicides and herbicides are being extensively used for crop protection and their residues ultimately reach the aquatic environment and affect those life forms at all levels of food web.
Until now there is no proper understanding of the magnitude of pollution or the damages caused by the pollutants to the living organisms of the aquatic ecosystem.

Therefore specialised knowledge is required to understand the problems of preservation and improvement of environment. Since the algae are extremely important components of aquatic ecosystem, it is important to examine the effects of pollutants on algae.

Algal assays contribute to the efficient analysis of water quality and are necessary to obtain appropriate quantitative data expressing the relationship between the pollution load and the biological response of the receiving water. Algal assays are the source of relevant and quantitative information about the availability of chemical substances to algae and their different stimulative or inhibitory effects.

The origin of algal bioassays can be traced to the work of Prof. Martinus Beijerinck (1899) who was the first to obtain a pure (axenic) culture of algae. Axenic cultures are an important component to algal bioassay culture methods.

The use of different pollutants such as biocides are increasing day by day and it has been reported that in India within the last 30 years the use of biocides has become 40 times higher i.e, from 2,000 tonnes to 80,000 tonnes. Eventhough these biocides afford remarkable benefits to mankind by increasing crop yields, protecting forests and also by con-
trolling arthropod vectors of serious human disease, they may produce adverse effects on the ecosystem. Most of the biocides are usually applied to the terrestrial habitats, but by accidental fall out of spray from agricultural treatments, fall out from atmosphere and also by surface run off from agricultural land, they may ultimately reach non-target organisms in the aquatic ecosystem. The results of pesticide residue analysis indicate that the pesticides can reach non target organisms in the aquatic environment and give indications of biological reservoirs of pesticides in the environment.

The present study was undertaken to make a detailed investigation for the assessment of specific impact of commonly used biocides at the lower trophic level of food chain i.e., microalgae by using batch culture techniques in the laboratory. Microalgal representatives from three habitats i.e., fresh water, estuarine and marine were investigated. The different biocides selected are of common use in the agricultural practices.

Because of the importance of microalgae as live feed for larval and postlarval stages of different aquatic organisms, the fluctuations in algal populations as a result of biocide treatment will surely affect the food chain. These studies are also of significance in setting the criteria and standards for water quality management by suggesting threshold values of different biocides tested, beyond which they affect the ecosystem adversely.

The research work for the thesis was started after the completion
of six months course programme in mariculture. During the course work
the candidate got familiarized with different research techniques which
were useful to carry out this work. Most of the facilities for doing the
work were available at the Algology Laboratory of the Central Marine
Fisheries Research Institute. However, for analysing the pesticide residues
using Gas Chromatography, the candidate made use of the facilities avail­
able at the Indo Cargo Surveyors, Cochin.

The thesis has been divided into six chapters. The Introductory
chapter explains the relevance of research work undertaken. A review
of work already carried out on the effects of biocides on microalgae
is presented in the second chapter. Chapter three gives a detailed descrip­
tion of the material and methods followed for the study.

The fourth chapter gives the results and discussion of all the experi­
ments carried out. This chapter mainly focuses on five important aspects.
The first part of the chapter gives the results of bioassay studies which
are essential to find out the effective concentration of biocides which
inhibit fifty percent growth of microalgae. The second part gives an
idea of the effect of five biocides and their combinations on the physiolo­
gical aspects of three microalgal cultures. The third part explains the
effect of biocides on the protein and carbohydrate contents of microalgae.
As bioaccumulation studies are very important particularly in the case
of organochlorines, an experiment was conducted with one microalgae
and the results of this study are also given in chapter four. Last part
of this chapter gives important morphological changes observed as a result
of biocide application.

A detailed general discussion about all the experiments carried out is included in chapter five. The last chapter embodies the salient conclusions generated out of the study.

It is hoped that the results and conclusions drawn from these investigations will be useful in the pollution control of estuarine and nearshore environments, as well as for improving the culture aspects of marine algae as live food in hatchery systems.