PREFACE

The deterioration of environmental quality started when mankind first congregated into villages and it has developed into a serious problem since the industrial revolution. Under the pressure of exponentially growing human population and the impact of industrialization and urbanization, environmental contamination of air, water, soil and food, poses a threat to the continued existence of many plant and animal communities of various eco systems, ultimately threatening the very survival of the human race.

Pesticides have become an important aspect of the modern society, primarily because of the agricultural and public health benefits derived from their use, consequently, the volume of the pesticides used and introduced into the environment has grown markedly over the past several decades. Although strict controls have been imposed on the production, distribution and application of pesticides, their escalating global use has hindered attempts at carefully monitoring potential environmental impacts. Unlike heavy metals, most of which occur naturally in the environment at low background levels, pesticides are mainly synthetic organic compounds that are deliberately introduced into the environment to control selected organisms. However, they are not specific in their toxicity and can have significant inhibitory effects on non-target organisms and biological processes. This problem has elicited growing concern regarding the effects of the pesticides on non-target components of the biosphere, especially the fishes, which form an important component of food chains. The pesticides sprayed over the crops are leached out from the crops by rain water and eventually find their
way into the aquatic ecosystem and are of great concern due to their toxicity to fish.

Between the arguments of ecologists who want to ban all the pesticides and agriculturists who need them in more quantities requires a more reasonable idea to find out alternative pest control methods and to investigate the hazards caused by pesticides and minimize their use. Solution does not lie in stopping the creative work, but perhaps in clever and intelligent use of the pesticides so as to maintain the ecological blank to work out the possible hazards caused by the pesticides. Environmental toxicology has so far evolved three generation of pesticides, the first being the organochlorides, the second organophosphates and the third synthetic pyrethroids. The synthetic pyrethroids are extremely potent and broad spectrum insecticides and they are found to be highly effective in low concentration. About 20,000 species of fishes worldwide constitute half of all living vertebrate species. They represent an important component of aquatic life. Fish serve as a staple food for human beings. Moreover, fish species are considered to be good indicator of aquatic pollution. Many fish kills due to water pollution are reported annually. Freshwater fishes are relatively more exposed to pollutants as the pollutants get into freshwater streams, rivers, tanks and lakes. Even though there are lots of data available on the effects of pyrethroids on freshwater fishes but it is largely inconsistent and incomplete. Therefore, the present study has been carried out in the freshwater fish, Cirrhinus mrigala and a highly photo stable, degradable, non-persistent, low mammalian toxic insecticide cypermethrin is used as the toxicant.
The introduction presents a brief survey of literature relevant to the present work, the environmental toxicity of the pyrethroid and the present status of the pollution problem in India are highlighted. After evaluating the toxicity of cypermethrin to the fish, lethal (5.13 μg/l) and sub lethal concentration (1/5th of lethal) has been chosen to conduct the experiments. The first two chapters present the study of behavioural changes and whole animal oxygen consumption of the fish treated with both lethal and sub lethal concentrations of cypermethrin for different exposure periods. The third chapter deals with ions and associated ATPases. The fourth is devoted to analyze the impact of cypermethrin on protein metabolism in functionally different tissues i.e., gill, muscle and liver. The fifth chapter deals with the histopathological observations in different tissues i.e., gill, intestine, liver and kidney. This investigation represents a preliminary effort on the part of the author to understand the physiological, biochemical and histopathological responses of fish, Cirrhinus mrigala in a selected tissue exposed to cypermethrin.

No doubt, the present work is only preliminary, a small segment of this vast subject of pyrethroid toxicology is examined here. Further study is necessary to arrive at definite conclusions. There may be a few lapses in the interpretation of results. A rapid limitation in the availability of laboratory facilities and time for completion of this prevented the researcher from penetrating into the core of this investigation. Nevertheless the researcher is hopeful of pursuing this work further.