CHAPTER IX

SUMMARY

In the present investigation, an attempt was made to study the sublethal and lethal effects of endosulfan and phosphamidon individually, on the economically important edible freshwater fish, *Mastacembelus armatus*.

1. Acute toxicity bioassays were conducted for endosulfan and phosphamidon. The 96 hr LC 50 values were 0.0032 mg/l for endosulfan and 8.881 mg/l for phosphamidon. The degree of toxicity was greater for endosulfan. Three sublethal concentrations, namely 1/10, 1/20 and 1/30 of the LC 50 values were selected for each pesticide for studying their effects on various biochemical constituents.

2. Investigations on the biochemical parameters of the pesticide exposed *M. armatus* revealed the following facts:

   (i) depletion of glycogen, was more pronounced during the short-term studies rather than during long-term studies.

   (ii) degradation of total carbohydrates in the tissues and the elevation of total carbohydrates in the blood, were also significant in the acute studies than the chronic studies.
(iii) Lactic acid formation was observed due to increased LDH activity, up to 20 days of exposure. A slow decrease of lactic acid level followed by an elevation of pyruvic acid was observed at 30 days of exposure, coinciding with the decrease of LDH enzyme in the liver, ovary and brain.

(iv) Depletion of protein content was discernible in the tissues followed by elevation of acid phosphatase enzyme in all the tissues.

(v) Elevation of total lipid, triacylglycerol and cholesterol were observed in the liver, ovary and blood; and a significant depletion of these three metabolites in the kidney, muscle and brain. Increase of total lipids, triacylglycerol, coincided with the decrease in lipase activity. Elevation of lipase activity was found to cause decrease of depot lipids in the kidney, muscle and brain. Changes in the fat metabolites were more pronounced during the chronic exposure than the acute exposure period, since lipids were the energy source for the fish when subjected to long time exposure to pesticides.

(vi) Enhancement of acid and alkaline phosphatases, but alkaline phosphatase showed a declining trend in the liver and ovary.

(vii) Diminution of ATPase indicated a low catabolism of ATP molecules.
(viii) Increase of FFA content was observed due to be synthesis and mobilization from depot lipids, but the liver and ovary showed a decreased level of FFA due to the inhibition of lipase activity.

3. Significant dose and time dependent increases were observed in the levels of sodium and magnesium while dose and time dependent decreases were observed in the levels of potassium and calcium. These changes were thought to be originated from ultrastructural tissue lesions and other changes.

4. In the studies on growth, decreases were observed in the rates of increases in length and weight of the fish, gonadosomatic index and hepatosomatic index, and a change in the length-weight relationship.

5. Histopathological studies revealed changes in the structural integrity of the cells of liver, ovary, kidney, gill and brain. The results of the present study indicate that *M. armatus* is a potential biological indicator of environmental pesticide pollution and might be suitable species for the evaluation of water quality.

6. The studies on the accumulation of the pesticide residue in the natural environment revealed that the accumulation of residue of endosulfan and phosphamidon was higher in the sediments of the irrigation canal than the water. Fishes collected from the confluence area showed the
accumulation of phosphamidon residue in the liver only. In the highest sublethal concentrations, during 30 days of exposure in the laboratory, the accumulation of pesticides residue was found to occur in liver and ovary. But no accumulation of endosulfan and phosphamidon was detected in the other tissues during the experimental period.