SUMMARY
SUMMARY

The pesticides used under present investigation have the wide range of utility to protect different crop diseases in the Mahakaushal region of Madhya Pradesh. The results obtained in the present investigation show that the freshwater fish Mystus vittatus, is highly affected with Aldrex and Nuvan group of pesticides. The results do not exactly point out the exact action of these pesticides, but help to understand the severity and strength of damage to the fish.

The freshwater resources such as rivers and streams are largely affected by several external and internal changes such as pH, hardness, temperatures and light, etc. These factors also affect the toxicity of the pesticide. Each pesticide has its own toxic action, the differences lie in its severity as it changes with change in hydrobiological and ecological conditions of
the freshwater body.

In the chapter, Material and Methods, different methodologies used to determine the LC$_{50}$ values, acute exposure and sublethal exposure for different concentrations of the pesticides have been given along with the methodologies in estimating the protein, lipid, glycogen, oxygen consumption and histopathological observations.

Acute toxicity studies of the pesticides, Aldrex and Nuvan, were conducted on Mystus vittatus.

The toxicity of Aldrex and Nuvan to the fish is a function of concentration and duration of time.

Different environmental variables like change in pH, hardness, temperature and alkalinity of water modify the toxicity of the pesticides.

Aldrex is found to be highly toxic to this fish than Nuvan.
*Mystus vittatus* appears more resistant to Nuvan than Aldrex. The fish shows symptoms of poisoning. They are: uncoordinated movement, change in the rate of opercular movements, hyperexcitation, increased surging and surface activity with loss of balance.

The feeding rate, mortality, survival and specific growth rate was studied in the fish *Mystus vittatus* under chronic exposure of Aldrex and Nuvan. 10-30% mortality was observed in chronic stress of Aldrex and Nuvan.

The chronic toxicity of Aldrex and Nuvan affected the rate of food consumption thereby affected specific growth rate.

Feeding behaviour of the fish was affected in early exposure period (1-4 weeks) and then the impact was lost. It could be due to repair of the damaged taste mechanism or acclimatization of fish to the polluted environment.
The retardation in growth exactly not known but it might be due to the disorder found in histopathology and physiology in the tissue and possibly due to accumulation of pesticides in different tissues and their actions.

In the chapter, Oxygen Consumption, the results show that 96 h LC$_{50}$ concentration affected significantly ($P < 0.05$) the rate of oxygen uptake. During 48 h and 72 h periods of exposure, the fish seemed to regain the normal rate of oxygen uptake, which was significant at $P < 0.05$.

The results obtained after 24, 48, 72 and 96 h of exposure to different concentrations of Aldrex and Nuvan were compared with zero hour readings.

Acute exposure of pesticides showed sudden decrease in oxygen consumption. The effect of sublethal concentrations of Aldrex in regards to its oxygen consumption does not show much variation in the pattern
of oxygen uptake exposed to different concentrations of pesticides.

*Histological studies of the pesticides, Aldrex and Nuvan, were conducted on *Mystus vittatus*.*

Higher degree of cellular damage in gills, intestine, kidney and liver was induced at acute and chronic exposure to Aldrex and compared with Nuvan, indicating high sensitivity of fish towards organochlorine pesticide, Aldrex.

Severe amount of histopathological changes were induced in gills, liver and kidney by acute and chronic exposure of Aldrex and Nuvan. A least amount of histopathological changes in intestine were induced by acute and chronic exposures of Aldrex and Nuvan.

A possible role of pesticides inducing histopathological changes is discussed in the Sixth Chapter.

Effects of sublethal concentrations of Aldrex and Nuvan on biochemical constituents of muscles and liver
of *Mystus vittatus* under chronic stress for eight weeks have been studied.

Analysis of results indicate that Aldrex causes more reduction in biochemical resources as compared to Nuvan.

Changes in biochemical constituents were a function of pesticide concentration and exposure period.

Biochemical values are also found affected and are included in Seventh Chapter. The protein content decreased in liver and muscles. Similarly, glycogen content increased in liver and decreased in muscles due to the exposure with both the pesticides.

Lipid contents decreased in all the tissues. Ascorbic acid increased in liver and muscles exposed to different concentrations of pesticides, Aldrex and Nuvan. These fluctuations indicate disturbed physiological activities. These findings help in understanding that even at very low concentrations of
the pesticides functional disorders of the organs are found there which becomes a cause to mortalities of fishes in a natural environment. Possible role of these pesticides in inducing changes in biochemical reserves is discussed.

The present investigation shows the degree of damaging the tissues due to the toxic effect of pesticides used. Though it does not give a definite clue against the damages done by the pesticides or toxic nature of the pesticides but click to think over the severity and the importance of pesticidal menace. It can be concluded that it has become essential today to take precautionary measures against the wide or unnecessary usage of the pesticides, although needed. Decreasing rate in the use of the pesticides will help to conserve the natural fauna such as fish, which is considered as a commodity today to take more for its nutritional value.