SUMMARY
1. The experimental fish *Labeo rohita* were collected from a local fish form (previously untreated with any pesticide) and adapted to laboratory conditions. The entire data of this investigation on biochemical responses of fish in relation to the synthetic pyrethroid cypermethrin toxicity was analysed in small size fish and large size fish.

2. Studies involved in evaluation of toxicity were conducted to determine LC$_{50}$ values for 96 hours exposure of cypermethrin through probit analysis and the LC$_{50}$ values are found to be 0.4216 for small fish and 0.6302 ppm for large fish of *Labeo rohita*, from the LC$_{50}$ values of the cypermethrin approximately one fifth value of LC$_{50}$ (0.08ppm) were chosen as the safe sub lethal concentration of the cypermethrin for the following physiological and bio-chemical analysis of the present investigation.

3. The symptoms of the lethal poisoning induced by cypermethrin are observed in the fish *Labeo rohita*. These symptoms are exhibited in the form of body colour changes, changes of gill colour, cloacal changes, changes in pectoral fins, abdominal changes, secretion of mucus, swimming movements and surfacing phenomenon. These symptoms are more pronounced in small size individuals of *Labeo rohita* when compared to their larger counter parts. These features
of poisoning are attributed to the abnormal behaviour of *Labeo rohita* during lethal exposure of cypermethrin.

4. The rate of oxygen consumption of *Labeo rohita* during sub lethal concentration of cypermethrin was studied separately for both small and large fish for the periods of 24 hrs, 7 day, 15 day, 20 day and 30 day, besides in freshwater without cypermethrin as control. The rate of O$_2$ consumption in both small and large fish registered an initial increase in 24 hrs exposure periods. This may be attributed to increase in locomotary activity arising out of the animal tendency to escape from the stress medium, this situation is termed as ‘escape reaction’ by the fish *Labeo rohita* later on there is gradual decline in O$_2$ consumption in 7 days period followed by a maximal decrease at the middle period (15 day exposure period). But during later half of 30 days exposure period, the rate of O$_2$ consumption raised from its earlier maximal decrease through 20 days period and reached to the control medium i.e. at the 30 days exposure period. This indicates the adaptive capacity of both small and large fish to recover from the sub lethal exposure of the cypermethrin. Thus to sub lethal concentrations 0.2 ppm for small fish and 0.3 ppm for large fish of this pesticide could cause physiological system (O$_2$ consumption to oscillate outside its normal range of variation, mostly suppressive, yet with time (with in 30 days), the rate of O$_2$ consumption could show indication of its return to normal state
without suffering lasting effects leading to the maintenance of homeostasis during cypermethrin exposure. The percent recovery is found to be more in large fish (92.30%) than that of the small fish (90.47%) because the detoxification mechanism might be more developed in large fish than small fish of the *Labeo rohita*.

5. The results obtained in experiment revealed an elevation in blood glucose with concomitant decrease in liver glycogen showing inverse relationship to each other. This suggests that the blood glucose is derived from liver glycogen through the metabolic pathway glycogenolysis in *Labeo rohita* to meet the higher energy demands during cypermethrin stress. Thus one can attribute the hyperglycemic condition in blood for increased carbohydrate metabolism in both small fish and large fish of *Labeo rohita* during cypermethrin exposure. The effects of cypermethrin is found to be more in 15 day exposure period where as the effect gradually decreases during later half of the 30 day exposure periods because of the detoxification mechanism might be operating. The percent recovery is found to be more in large fish 96.10% of blood glucose and 94.65% of liver glycogen than the small fish i.e., 93.65% of blood glucose and 92.86% of liver glycogen. The effects of cypermethrin in muscle glycogen is found to be more in 24hrs exposure period where as the effect gradually decreases during later half of the 30 day exposure periods because the detoxification
mechanism might be operating. The percent recovery is found to be more in the large fish i.e., 93.63% of muscle glycogen than the small fish i.e., 91.84% of muscle glycogen. Thus the fish *Labeo rohita* exhibited an overall suppressed trend in all the parameters during the stress phase i.e., the first half of the sub lethal exposure of cypermethrin. But in the later half of the sub lethal exposure period the fish has shown fairly good amount of recovery with signs of adaption, this could be possible by the activation and operation of detoxification mechanism during toxic stress induced by a synthetic pyrethroid cypermethrin, this fish has taken 30 day to adapt to the sub lethal exposure of cypermethrin.

6. The results obtained in experiment revealed decrease in liver and muscle proteins with concomitant increase in liver and muscle amino acids showing inverse relationship to each other. The effects of cypermethrin is found to be more in 15 day exposure period where as the effect gradually decreases at 20 day exposure period because of the detoxification mechanism might be operating. The percent recovery is found to be more in large fish 95.89% of liver proteins and 98.10% of muscle proteins than the small fish i.e. 93.65% of liver proteins and 96.89% of muscle proteins. The percent recovery is found to be more in large fish 98.67% of liver amino acids and 98.46% of muscle amino acids than the small fish i.e. 97.88% of liver amino acids and 97.67% of muscle amino acids.
Thus the fish *Labeo rohita* exhibited an overall suppressed trend in all the parameters during the stress phase i.e. the first half of sublethal exposure of cypermethrin. But in the later half of the sublethal exposure period the fish has shown fairly good amount of recovery with signs of adaptation, this could be possible by the activation and operation detoxification mechanism during toxic stress induced by a synthetic pyrethroid cypermethrin, the fish has taken 30 day to adapt to the sublethal exposure of cypermethrin.

7. The results obtained in experiment revealed a decrease in both total fats and free fatty acids content in 24 hrs exposure period. The effects of cypermethrin is found to be more in 15 day exposure period where as the effect gradually decreases during later half of the 30 day exposure periods in liver and muscle fats but in liver and muscle fatty acids, the effect is found to be more in 30 day exposure whereas the effect decreased in 15 day exposure periods because of the detoxification mechanism might be operating. The percent recovery is found to be more in large fish 96.89% of liver fats and 96.74% of muscle fats than the small fish i.e., 94.65% of liver fats and 95.89% of muscle fats. The percent recovery is found to be more in large fish 98.23% of liver fatty acids and 97.89% of muscle fatty acid than the small fish i.e. 96.65 % of liver fatty acids and 96.34% of muscle fatty acid. Thus the fish *Labeo rohita* exhibited an overall suppressed trend in all the parameters during
the stress phase. But later on the fish has shown fairly food amount of recovery with signs of adaptation, this could be possible by the activation and operation detoxification mechanism during toxic stress induced by a synthetic pyrethroid cypermethrin, thus fish has taken 30 day to adapt to the sub lethal exposure of cypermethrin.

The findings of this investigation provide a physiological and biochemical differences basing on the size of the fish in that the large fish individuals are found to be less sensitive and susceptible but more recoverable, resistant to a synthetic pyrethroid, cypermethrin toxicity than the small fish, indicating ultimately that the large fish of the *Labeo rohita* are more efficient pollutionally with reference to cypermethrin than small fish. Therefore the large fish of *Labeo rohita* are found to be better adapted than small fish during sublethal exposure of a synthetic pyrethroid cypermethrin.