Pesticides are substances used to control pests including insects, water weeds and plant diseases. They are categorized according to their target use. The three major groups of pesticides are herbicides, insecticides and fungicides. Pesticides are beneficial chemicals, can protect against forest and farm crop losses and can add more efficient food production but also have profound effects on aquatic life and water quality. As per statistics, production and productivity of agriculture have increased. However, the high chemical usage of pesticides to bring about these spectacular increases in food production is not without its problems. A visible parallel correlation between higher productivity, high chemical input use and environmental degradation effects is evident in south Gujarat where commercial agriculture is widespread. Like other sectors, south Gujarat is ahead in agriculture field. Numbers of cash and agriculture crops are grown. Crops like rice, maize, jowar, cotton, banana, mangoes, cheeku, pomegranate and all types of vegetables are grown in south Gujarat to get more and better production farmers use various types of pesticides. Among these, Cypermethrin is most commonly used pesticide.

Cypermethrin is a synthetic pyrethroid insecticide used to control many pests, including moth pests of cotton, fruit, and vegetable crops. It is also used for crack, crevice, and spot treatment to control insect pests in stores, warehouses, industrial buildings, houses, apartment buildings, greenhouses, laboratories, on ships, rails, cars, buses, trucks, and aircrafts. It can also be used in non-food areas in schools, nursing homes, hospitals, restaurants, hotels, in food processing plants, and as a barrier treatment insect repellent. Since the Cypermethrin has multiple uses, it possibly enters into Tapi river through runoff and may cause deleterious effects to aquatic environment.
Present study was undertaken to assess the effect of globally and regionally used pyrethroid insecticide, Cypermethrin on a non-target organism commercially important edible, fish *Labeo rohita* with reference to its tolerance limit (TLm 96 hrs), histopathological, haematological and cytogenetic observations.

Fishes were exposed to different concentrations of Cypermethrin for the evaluation of TLm- 96 hrs. The concentration at which 50 % fish survived was 0.06 ppm. All the fishes died when exposed to 0.10 ppm. Fish occupied twice the area than that of the control group. Behavioural changes were recorded in fishes as irregular, erratic movements followed by imbalanced swimming activity in fishes with higher exposure of Cypermethrin. Respiratory disruption was observed in normal ventilating cycle with rapid repeated opening and closing of the mouth and opercular coverings. The fish progressively showed signs of tiredness and weakness. At the end of 96 hrs, fishes lost their equilibrium and eventually died with their mouth and operculum wide opened. A change in color of the gill lamellae from reddish to light brown with coagulation of mucus on gill lamellae was seen in dead fishes. However, the behavioural responses were not much pronounced at sublethal concentration, indicating that they were concentration and time dependent.

Histopathological lesions in gill revealed with mucus secretion, fusion of secondary gill lamellae and damage in central cord in fishes exposed to sublethal concentration of Cypermethrin. The head region of secondary gill lamellae was noticed with the abrasion. Severely damaged gills lost the identity exposed of lethal concentration leading to dilation of central cord, highly clubbing of secondary gill lamellae and other degeneration changes. Lamellar aneurism was also found at various stages.

Initially, swelling in hepatic cells was noticed in liver of treated fishes. Degeneration of cytoplasm resulted in vacuolization of hepatic cells. Blood sinusoids
were also affected. Exposure of sublethal, lethal and acute lethal concentrations of Cypermethrin led to vertical gaps among hepatic cells at the end of the experiment.

Shrinkage in renal tubules resulted in intratubular space. Cytoplasmic precipitation with damage in nuclei was noticed. Brush border of proximal tubules was disrupted. Haematopoetic tissue were also damaged. Acute shrinkage in glomeruli was observed with higher exposure of treatment. Occlusion of tubular lumen was also noticed with the exposure of fish to lethal concentration.

Histopathological structure of brain (optic tectum) did not show major changes with all the exposures of Cypermethrin to *Labeo rohita*.

Cypermethrin caused perturbations in haematological indices which could lead to impairment of the normal physiological process and reduced ability to combat pesticide stress. Haematological indices were found to be affected in *L. rohita* exposed to different concentrations of Cypermethrin. Quantitative estimation showed gradual decline in haemoglobin and RBC numbers. Other haematological parameters like WBC, PCV, MCV, MCH and MCHC were also affected. Size of RBC’s was reduced in fishes exposed to sublethal, lethal and acute lethal concentrations. Shape of RBC became rounded and irregular. Hypochromia, thickening of cell membrane, vacuolization in cell was also observed. Micronuclei frequency in RBC was increased exposed to sublethal (6.8 %), lethal (7.25 %) and acute lethal concentration (3.75 %) during the experiments as compared to control

Sublethal treatment did not show any abnormalities in fish chromosome. The lethal exposure brought chromosomal aberrations in the form of rings, acentric fragment, double minutes, endoreduplication and premature separation of chromosome. Pulverization configuration was observed only in the treatment of acute lethal concentration.
Results of comet assay showed that the DNA in RBC was affected by all three concentrations of Cypermethrin. However, the acute lethal concentration (0.10 ppm) brought maximum changes with increase in size of COMET tail.

Findings of the work, carried out during the experiments on *Labeo rohita* to different concentrations of Cypermethrin which is used in agriculture to control the pests, indicated that the pesticide was highly toxic and imposed catastrophic effects on fish at sublethal lethal and acute lethal concentrations. Altered behavioural, histopathological, haematological and cytological responses could be used as a tool in bioassessment to monitor ecotoxicity risks of Cypermethrin to the test species in particular and freshwater fish species in general. Definitely the study would provide valuable scientific data for formulating biomonitoring programmes in the region or elsewhere. Besides the damages caused to the fish due to the Cypermethrin could pose a health problem to human beings because of biomagnifications.