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Toxicity experiments for cyhalothrin technical grade formulation were conducted using static for 24, 48, 72 and 96 hrs exposures. The LC₅₀ values were calculated following the method of Finney's probit analysis by using per cent and probit mortalities against log concentrations. The results showed that cyhalothrin technical grade is more toxic than 2.5% active ingredient EC.

On exposure to sublethal and lethal concentrations of cyhalothrin some behavioural changes such as the increase in opercular activity, surfacing phenomenon, loss of equilibrium, hyper excitation and mucus production were observed in the test fish *Labeo rohita*. Also, a thin film of mucus was observed all over the body including the gills.

The oxygen consumption of the exposed fish was found to be increased over control fish during the initial stages of exposure, and this increase declined gradually till the end of exposure period 24 hrs. The initial increase might be attributed to the increased locomotory activity arising out of the animals tendency to escape from the toxic medium. The gradual decline thereafter was attributed to the interference of cyhalothrin with oxidative metabolism and also due to histopathological changes that occur in the gill architecture.

Several metabolic alterations were observed in the test fish after exposure to sublethal concentrations of cyhalothrin of 8 days. The glycogen which is the major storage form of carbohydrates has reduced in all the tissues tested. The per cent decrease of glycogen after 4 days of exposure was in the order of liver> muscle> gill> brain>kidney. The glycogen content decreased in all the tissues, but the decrease is highly significant in liver. Little amount of glycogen was present.
in the kidney tissues of control and only a slight decrease was observed in sublethal exposure.

Under exposure to sublethal doses of cyhalothrin technical grade, the total protein content was found to be decreased in all the tissues tested. Maximum decrease was noticed in gill and muscle followed by brain, kidney and liver at 8 days exposure. At 24hrs exposure, significant decrease was noticed in all the tissues. At 48 hrs exposure, maximum decrease was observed in muscle and gill tissues. Similar trend was observed in the same tissues even at 96 hrs of exposure. The apparent decrease of total protein content, under sublethal exposure to cypermethrin, may be due to the detoxification of enzymes. The decreased tendency of total protein may also be due to metabolic utilization of the ketoacids in gluconeogenesis pathway for the synthesis of glucose or may be due to directing the synthesis of protein from free amino acids.

On sublethal and lethal exposure to cyhalothrin technical grade, the LDH activity was found to be increased in all the tissues of the fish *Labeo rohita* compared to control. The per cent increase in LDH activity after 8 days of exposure lethal was in the order of: liver > muscle > gill > brain > kidney, and under sublethal was in the order of: liver > brain > muscle > gill > kidney respectively. Lactate dehydrogenase (LDH) converts the lactate to pyruvate and has very important role in carbohydrate metabolism. LDH activity depends on its isoenzymes – LDH has 5 isoenzymes and the activity changes under pathological conditions. The increase in LDH activity suggests the increased anaerobic condition during cyhalothrin technical grade and 2.5% EC lethal and sublethal exposure. LDH activity increases during the conditions that favour anaerobic respiration to meet the energy demands, where aerobic oxidation is lowered.

The activity of AAT and ALAT, in general, increased in all the tissues of fish viz *Labeo rohita* exposed to lethal and sublethal concentrations of cyhalothrin technical grade and 2.5%EC. The increase in the activities of AAT and ALAT as
observed in the present study may also be due to the mitochondrial disruption and tissue damage, as a result of cyhalothrin induced stress. Under the altered protein metabolism, the transfer of amino group is very essential for the reutilization of amino acids and to counter-check the excess proteolysis under pesticide stress.

Under exposure to sublethal and lethal concentrations of cyhalothrin technical grade and 2.5% EC, the amount of acid phosphatases (ACP) was found to increase in all the test tissues of *Labeo rohita*. The increase is more in gill and brain tissues. The phosphatases are active at specific pH and are usually termed phosphomonoesterases. The increased ACP activity seems to result from enhanced enzyme turnover under pesticide stress. Increase in acid phosphatase activity can also be interpreted as a shift of the tissue emphasis on energy breakdown pathway from normal ATPase system to phosphatase system. In the event of decreased ATPase system, phosphorylation may be proceeded by activated phosphatases to catalyse the liberation of inorganic phosphatases from phosphate esters.

Under exposure to sublethal and lethal concentrations of cyhalothrin technical grade and 2.5% EC, the amount of nucleic acids (DNA and RNA) were found to decrease in most of the tissues of the test fish *Labeo rohita* except in liver and gill. The depletion of DNA was maximum in brain muscle and kidney whereas the depletion of RNA was maximum in liver and brain tissues.

The activity levels of ACh.E in general, were decreased in all the tissues of test fish *Labeo rohita* under sublethal and lethal exposures of cyhalothrin technical grade and 2.5% EC. Maximum depletion was observed in brain and liver tissues. The variation in activity levels of acetyl cholinesterase in different tissues of fishes suggests the neural activities of those particular organs. The decreased activity levels of ACh.E activity may be due to the occupation of the OP compound with the active site of ACh.E followed by phosphorylation of the
phosphorus of the OP to the oxygen of the hydroxyl group of serine at the active site.

The histopathological changes in certain vital tissues like gill, liver, and kidney in the fish *Labeo rohita* exposed to sublethal and lethal concentrations of cyhalothrin were studied. Cyhalothrin caused highly marked pathological changes in the gill than brain, liver and kidney. They include progressive degeneration, bulging of tips of primary gill lamellae, club-shaped secondary gill lamellae and other severe necrotic changes in the epithelial cells of secondary gill lamellae. Cyhalothrin also caused profound pathological changes under chronic exposures in liver tissues of the test fish such as degeneration of cytoplasm in hepatocytes, atrophy, formation of vacuoles, necrosis, disappearance of hepatocytic wall, disintegration of lattice fibres and appearance of blood streaks among hepatocytes. All these changes indicate the hepatotoxic nature of the cyhalothrin. Since synthetic pyrethroids are neurotoxins, the cyhalothrin intoxication caused atrophy, chromatolysis, i.e., dissolution of the nissl bodies and loss of stainable substances within the cytoplasm noticed. Renal excretion is one of the ways of eliminating the non-detoxified toxicant molecule resulting in severe pathological changes in haemopoietic tissue, severe necrosis, cloudy swelling of renal tubules, disintegration of interstitial tissue, pyknotic nucleic, etc were also noticed.

The fish *Labeo rohita* were exposed to cyhalothrin technical grade and 2.5% EC sublethal (1/5 of 96 hr LC50) for 8 days, and bioaccumulation in gill, muscle, liver, brain and kidney tissues were estimated. Cyhalothrin residues were conformed through thin layer chromatographic method. The extracts were cleaned up using the column chromatography. The quantity of residues in the tissues test fish were estimated by the sensitive gas liquid chromatography. Since this toxicant is having less half-life period and easily metabolized to its isomers by the organisms *Labeo rohita* tissues bioaccumulated only trace amount of pesticide residues.
Briefly, the present work revealed that the variations in bio-chemical parameters serve as indices in monitoring the pathological status of the pesticide treated fish. These variations were found to be tissue specific and hence, can be used as meaningful indicators of pesticide pollution. The above said parameters can be examined more critically to develop more meaningful indicators or markers to assess or to characterize a particular pollutant and its potential toxicity.

Since majority of pesticides are used regularly, and cumulatively in every season, their residues are known to bio-accumulate in the lipid tissues of fish and other animals, and transfer via food chain to the human bodies, the grave risk to the health of the people who consume these fish seems to be considerable. The need to protect the people form undue exposure to the pesticide residues through the food chain cannot be over emphasized. The appearance of cyhalothrin residues will also show impact on reproductive impairment of the commercially important fish and the carnivores, especially the birds.

Though we cannot avoid the use of pesticides, measures should be taken for the conservation of the water and the aquatic resources.