ACUTE TOXICITY

With increasing population, modern society becomes keen to care of the health and living conditions including nutrition, clothing, dwelling and transportation.

Environmental scientists all over the world have been tolling the warning bell against the danger polluting the natural water resources without regard to any consequences. The industrial waste water discharged into the nearby water bodies pose a serious problem directly or indirectly to aquatic biota. So, it is essential to find out lethal concentration of these effluents to safeguard them from the disastrous effect. In general, toxicology considers the study of interaction of materials (drugs, chemicals, drinks, foods, polymers, pesticides etc.) with a biological system and depicts adverse responses.

Toxicology may be defined as the basic science of poison study. A poison or toxicant may be any chemical substances which on entering the body of an animal in insignificant amounts, cause malfunctioning and leads to impairing health. Poison may be either a natural product of animal or plant origin or synthetic. The poison that synthesized within the organisms itself is referred to as endogenous poison or toxin and those which enter in organism from outside (environment) are referred as exogenous poisons or toxins. Exogenous chemicals are referred as xenobiotics.

Like many other developing countries, India also facing pollution problems of all ranges, namely eutrophication, heavy metals, acidification, persistent organic pollutants and traditional problems.

In India, it is now well realized that, the environmental problems are increasing exponentially in recent decades with rapid growth in human population. With the advent of agricultural and industrial revaluation, most of the water sources becoming contaminated (Khare and Singh, 2002). Industrial discharges containing
toxic and hazardous substances including heavy metals (Gbem et al., 2001, Woodling et al., 2001) contributing the pollution of aquatic ecosystem and cause threat to ecosystem (Joshi et al., 2002).

Water is one of the most important requirements of all lives to perform essential vital functions. But with the rapid growth of industries, pollution has increased tremendously. Improper modes of effluent discharge in the water bodies leads to pollution due to carrying deadly substances (Muthuswamy and Jayabalani, 2001).

Although, increased industrialization and urbanization are the chief causes of pollution but, profoundly have influences on our life. Recently Rachal Carson in her book ‘Silent Spring’ described the hazardous of chemical pollution and the unlimited indiscriminate use of persistent pesticides in the environment.

The tragedy of Union Carbide at Bhopal is an example of what chemicals could do to human race. Industrial development and agricultural professionalisation that took many decades in West, now is occurring at a much faster speed in third world countries like India, that making problems much complex.

The term ‘ecotoxicology’ was derived from the words ecology and toxicology and was first introduced by Truhaut in 1969 (Walker et al., 1996). Truhaut further defined ecotoxicology to be “the branch of toxicology that studies the toxic effects of natural or artificial substances on living organisms (e.g. fish, birds, plants), that constitute the biosphere (Rand et al., 1995). Ecotoxicology in simpler terms can be defined as ‘the study of the harmful effects of chemical upon ecosystem’ (Walker et al., 1996).

Aquatic toxicology is branch of the science compounds multidisciplinary scope and interdisciplinary practice’ (Rand et al., 1995) it involved as a field of study borrowing freely from other basic sciences. Aquatic toxicology requires a working knowledge of aquatic ecology, biological disciplines like physiology,
biochemistry, histology, behavior and environmental chemistry, to enable understanding the effects of toxic agent on aquatic organisms (Rand et al., 1995).

Since several years, acute toxicity tests have been used extensively to determine the effect of potentially toxic material (e.g. pesticides, metals and industrial effluents) on aquatic organisms for short term usually (4 days or less) and long term exposure. Most of the earlier acute toxicity tests were conducted freshwater organisms especially fishes, but the requirement for assessing the impact of the test materials in the estuarine and marine environment have provided the impetus for the improvement of such tests methods, for saltwater organisms both invertebrate and fishes. This development has been most pronounced since past 10-15 years.

The acute toxicity tests have been carried out to detect the sensitivity of species to a changed ecosystem; such responses can be used as an indicator for particular type pollution, and also useful in the determining of quality of pollutants, and to select their dose levels in a short term toxicity test. Brown (1976) listed twelve basic types of investigations in toxicity tests for preliminary screening of the toxic potentiality of chemicals. In biomonitoring studies, such tests are implied to determine the extent of risk to an aquatic organism, causing death so that it can receive special treatment.

Bioassay test was described by Sprague (1973) as a test in which the quality and the strength of material is determined by the reaction with living organisms. It is normally concerned with the determination of a dose where at the prime interest is to determine the degree of responses of the test animals and strength of stimulus. Lethal effects of toxic substances on fishes have received attention from pollution biologists. Alderdice (1967) has distinguished two general categories of toxic effects. He described acute toxicity as a large dose of poison for a short duration usually lethal, whereas, chronic toxicity was low dose of poison over a long periods
of time might be either lethal or sub lethal. The acute toxicity tests are generally reported in the terms of lethal concentration (LC) or median tolerance limit (TLM). LC$_{50}$ is the concentration at which 50% of the test animals survive, and TLM is an interpolated value based on the percentage of fish surviving at two or more concentrations at which less than half or more than half of the test animals survive. Investigations are mainly directed towards understanding the effects of pesticides on aquatic animals. The terms applied in this study are as “short term” or acute study and “long term” or chronic study for convince.

The acute toxicity studies were carried on different environmental pollutants like industrial wastes, herbicides, pesticides, heavy metals, detergents etc. which alters the ecological setup and normal aquatic quality. Such studies are useful in making comparison with unpolluted waters and also provide information on degree of pollution due to the pesticide and severe and rapid damage to the aquatic organisms by the fastest action of poisoning (Lund 1971). Usually, the exposure time period for the acute toxicity tests is 24, 48, 72 and 96 hr. in bioassay test, experimental organisms are subjected to a series of concentrations of known toxicant under adequately controlled conditions. Acute toxicity involves the damage to the organism by the fastest acting mechanism.

Acute toxicity studies have long played an important role in man’s efforts to monitor and modify the effects of toxicants on the biota. The term toxicity test and bioassay are frequently used interchangeably.

Acute toxicity tests have almost unlimited uses. The bioassay may be used in the determination of the toxicity of some material, the degree of toxicity, variability and the treatment methods. The other important use of acute toxicity test is the determination of relative sensitivity of various species to a pollutants and effects on their life stages.
Acute toxicity studies are especially useful in determining the sensitive species that can be used as an indicator species of an ecosystem that can be used as an indicator species for particular type of pollution. The acute toxicity test is a preliminary step to determine the concentration to be tests in short term (lethal) or long term (sub lethal) exposure. The acute toxicity test has far more frequently been employed than chronic exposure tests, but it is ordinarily only the first step towards acquiring meaningful information that can be obtained through long term or chronic studies. It can be usefully employed primarily as a basic for establishing the warning system of acute toxicity accidents and also as tool for the logical assessment of the initial toxicity difference amongst various biological systems.

The acute toxicity of various toxicants pollutants was undertaken in twentieth century by various workers. Ellis (1937) reported the methodologies to detection and measurement of stream pollution and the chemical analysis of the water. Hart et al. (1945) developed the technique for the evaluation of toxicity of industrial waters, chemicals and other substances to freshwater fishes. Doudroff and kertz (1953) advocated a more general use of fish as a test animal in toxicity and proposed appropriate standardization of the methodology.

Determination of toxicity of any compounds depends on a number of factors such as size, weight, age, sex and rate of administration of the compound. It is also influenced by environmental factors as temperature, light, water, hardness relative humidity etc. and physiological conditions of the animal such as physical activity stress, hormonal state and pathological conditions. Thus, in bioassay studies a living organisms becomes a reagent for the evaluation of potency of toxic substances and these were found to be more sensitive and reliable than physical and chemical investigation (Warren, 1971).

Acute toxicity tests or bioassays have played historical important role in assessing the effects on animals, and such tests have wide been applied. When
evaluating the toxicants of various types of mixers of pollutants to fish and other aquatic species (Craddok, 1977). The parameter of short-time mortality has been the most common measure of toxicity.

Toxicity of a chemical may be defined as the capability to cause injury in a living organism. A highly toxic substance is that which cause damage to an organism or biological system in a very small amount. But a substance of low toxicity will not produce effect unless the amount is very large. In short, toxicity may not be defined without reference to the quantity of a substance administered or absorbed (dose) the way in which the quantity is administered (e.g. inhalation, ingestion, injection), and the time required to produce injury.

Observations on the effect of industrial effluent on fishes have been made by number of workers in foreign countries as well as in India. Scientists have been trying to correlate the effects of these pollutants / toxicants with the fish life. The acute toxicity tests have been measured for in many species for variety of industrial effluent.


Sharma et al., (1982) studied the acute toxicity of Ketazin and Rogor in Channa punctatus (Bloch) and found ketazin is more toxic than rogor. Sharma et al., (1984) observed acute toxicity of sumithion and ketazin in Labeo rohita and found loss of equilibrium, lightening of body colour, secretion of excessive mucus and rapid jerky movements to higher concentration of both pesticides.
Santhakumar et al., (2000) studied acute toxicity of monocrotophos on ethological responses in *Anabus testudinosis* and observed behavioral changes. Nayak and Mishra (1998) studied the acute toxicity of certain detergents viz. ‘Surf’ and ‘Nirma’ in *Puntius ticto* and estimated the LC$_{50}$ value.

Pickering (1980) studied chronic effects of hexavelent chromium in Fathead Minnow (*Pimephales promelas*). Srivastava, et al., (2007) reported LC$_{50}$ value of pulp paper mill effluents in *Labeo rohita* at 10% and *Channa punctatus* at 15% and have reported the potency of effluent using LC$_{50}$ value and derived safe environmental concentration.

Literature shows that in a century back, toxicity tests of various pollutants in aquatic organisms were then undertaken firstly by Penney and Adams (1863) followed Forbes (1989) on the effect of organic pollutants on aquatic biological communities. Similar types of observations were made by Cairns and Schier (1963) Jhingran (1979). Sastry, et al., (1972) studied the problem of water pollution in Madhya Pradesh in fishes. Bliss and Cattle (1943), Godddan (1956), Bliss (1957), contributed most valuable information on toxicology of industrial effluents to aquatic animals.
RESULTS

The fishes were exposed to lethal concentration of distillery and dairy effluent for a short term, are studied for toxic effects of effluents in term of general behavior, survival and mortality.

Fishes exposed to zero toxicant were observed to have normal activities such as constant opercular movements, steady balance, normal surface phenomenon, non aggressive movements or irregular vertical revaluing movements. When the fish, Puntius ticto exposed to 25% concentration of distillery effluent for 24hrs the fishes showed hyper excitation, rapid opercular movement jerky movement, fish tried to leap out of medium, colour became dark. Along with this, there was thick mucous covering over the body surface and lethargic state leading to paralysis much later. Where as when fishes exposed to dairy effluent slightly changes in the behaviour which was intermediate, like rapid opercular movement, jerky movement, convulsions and thick mucous covering over body.

A survival percentage of the fish in different concentrations of distillery effluent has been recorded for LC$_{50}$ values of distillery effluent in Puntius ticto for 24, 48, 72 and 96hrs respectively. The LC$_{50}$ of distillery effluents found at 25%, 24%, 23% and 22% concentrations for 24hr, 48hr, 72hr and 96hrs respectively (Table No.13and Fig.No.51 ). These observations have been made under normal laboratory condition. Regression analysis of LC$_{50}$ values for 24, 48, 72 and 96hrs have also been calculated.

In dairy effluent, LC$_{50}$ values are noted at 40%, 39%, 37% and 36% for 24, 48, 72 and 96hr. respectively (Table No.14 and Fig No.52). Regression line LC$_{50}$ values for 24, 48, 72 and 96hr. have also been calculated.

During short term exposure, at higher concentration fishes got highly excited and erratic movements. After some time, fishes loose their equilibrium and died.
DISCUSSION

Most of the living beings knowingly or unknowingly are exposed to a variety of natural as well as man made stressors. Under certain conditions, such exposure causes health hazards, ranging suitable biological alterations. The action of pollutants in target and non target organs is necessary in the evaluation of toxicity effects. Acute toxic effects are generally evolving direct action of toxicants on target organs. These effects are usually dose –dependent, but certain other factors are also influence toxicity.

In the present study survival rate of Puntius ticto decreased with increase in the concentration of dairy and distillery effluent. Though exact cause of death is ill defined as there are number of channels, but the death may be the result of several alterations in physiological responses i.e. stress at cellular as well as organism level. The exact cause of death is explained by Abel and Skidmore (1975) studied that the severe physical stress is responsible for the death of fishes.

According to Parashar and Banerjee (2002) observed variability an acute toxicity in single species and single toxicant, depend on the size, age and condition of the test species along with environmental factors.

Monkiedje et al., (2004) reported acute toxicity of raw effluent from a battery manufacturing plant to a freshwater fish Oreochromis niloticus. The 48hrs LC50 and 48hrs LC90 values were 20.8% (V/V) and 26.6% respectively. The 96hrs LC50 and 96hrs LC90 values were 16 % (v/v) and 20.7(v/v) respectively. This effluent contains mostly heavy metal (Hg, Cd, Pb and Zn) Dieter and Manfred, (1998) and Conell, (1981). High levels of zinc in water lead to suffocate fish by damaging the gill epithelium by blocking respiration Albaster and Lyod, (1982), Dejoux, (1988). This study interpreted that chemical industrial effluent are highly toxic to aquatic life. Wagh and Khalid, (1985) reported that the LC50 value of pesticide suquin, in two freshwater fishes, Rasbora daniconius and Barbus ticto for 96hr at 0.35 and 0.175ppm respectively. It is interpreted that, the severity of toxicity depends on sensitivity of organisms. Muniyan and Veeranghavan (1999)
while working on toxicity of pesticide ethofenpros to *O.mossambicus* found erratic swimming, hyper and hypo activity, changes in opercular movements’ loss of equilibrium and mucus secretion all over the body.

Shukla *et al.*, (2006) studied toxic effect of copper and zinc in *Labeo rohita*. LC$_{50}$ of Copper was reported at 0.23mg/l and zinc, at 1.091mg/l. Composition of LC$_{50}$ values indicated that copper is more toxic than zinc. The acute toxicity of zinc to aquatic organism has been widely summarized by many workers on different organism (Douderoff and Kertz, 1953; McKee and Wolf 1963; Skidmore 1964).

The behavioural responses have been used as sensitive measure of stress syndrome in organism. In the present study, when fish *Puntius ticto* exposed lethal concentrations of industrial effluent (distillery and dairy) for 96 hr, behavioural changes have been noticed such as restless, loss of equilibrium, increased opercular activities, surface to bottom movement, sudden quick movement, copious mucous secretion in the fish which can be consider as defense against toxicant impact on the exposed body surface. Similar observations are recorded earlier by Haque *et al.*, (1993). Santhakumar *et al.*, (2000) observed mucous covering on gill reduce the oxygen supply and causing the death of fish *Anabus testudineus* (Bloch) when treated with monocrotophos toxicity. Similar results were observed by Durve and Jain (1980) when *Rasbora daniconius* treated with distillery effluent On LC$_{50}$ values of any industrial effluent it can be stated that increasing mortality rate depends on dose and exposure period. The fish exposed to higher concentration has got high mortality by short time period while, fishes exposed to low concentration show low mortality for the same time intervals hence, mortality varies according to concentration and exposure period.

Tilak *et al.*, (2006) reported the acute toxicity of ammonia, nitrite and nitrate and to the *Ctenophyngodon idella* using static and continues flow system for 24hr. exposure of ammonia(NH$_3$-N) Nitrite (NO$_2$-N)Nitrate(NO$_3$-N) were 0.2092,0.2323,23.40,21.05,262.50 and 236.30mg/l respectively. It is further reported that when fish exposed to different concentrations of ammonia they were
very active and swim rapidly. On exposure of different concentrations of nitrite, there was unusual behaves in the early period of exposure but, later they become active and swam in all erratic manners and then died. Rao and Shameen (2004) obtained 96hrs LC$_{50}$ of carbaryl at 14.64ppm Cyprinus carpio. Rate of mortality in fish exposed to carbaryl has been noted dose dependent.

Pronounced behavioural changes were observed during the acute toxicity tests, particularly during the initial stage of exposure. These include fast swimming activity, loss of equilibrium, excessive mucus secretion, and ultimately death at the bottom of the tank. On the other hand no such behavioral changes were noticed in the control fish, when remains active and healthy throughout the experimental period. Mishra et al.,(2000) carried short term static bioassay of raw and bioremediated dairy effluent to the test fish Labeo rohita LC$_{50}$ value of 96 hrs was 25.5%. The 96 hrs LC$_{50}$ value of cypermethrine was 5.13mg/l to the test fish Cirrhinus mrigala (Prashanth et al., 2005).

Bhattacharya and Mukherjee (1978) reported that the industrial effluent affects normal vision, proper body motion and behaviour of the organism. Omitoyon et al., (2006) reported 0.36 mg/l the 96h LC$_{50}$ value for lindane to juvenile fish Clarias gariepnus. At various concentration fish showed incessant gulping of air and increase in opercular ventilation. Mortality was observed in the higher concentration of 1.8mg/l with increasing period of exposure. Fish under stress (physical, chemical or starvation) mobilize triglyceride and protein to fulfill and increased demand for energy by the fish to cope with detrimental condition imposes by the toxicant/xenobiotics and meets energy requires sustaining increases physical activity bio- transformation and excretion of xenobiotics (Alkaham et al., 1998, Iwama et al., 1986, Sievers, et al., 1995).

Tilak et al.,(2006) reported acute toxicity of phenol in fish Catla catla, Labeo rohita and Cirrhinus mrigala, the LC$_{50}$ values for 24 h at 25.84, 30.32 and 34.97mg/l for static and 25.36, 27.15 and 30.69mg/l for continuous flow through
test. They further reported that; the difference in LC$_{50}$ values of phenol for different exposure times is possibly due to their differences in uptake rate of the toxicant.


Low concentrations of oxygen and high level of carbon dioxide also causes fish mortality (David and Roy, 1966). Specific toxic ingredients which may injure the gills and other external structures could lead to death of fish either from anoxemia or by intake and absorption (Jhingran, 1983). D’cruz and Miranda, (2006) studied the toxicity of the titanium dioxide effluent in the fish Oreochromis mossambicus.

Jignasa et al., (1997) reported the 96hrs LC$_{50}$ for textile and printing industrial effluent in the mudskipper, Periophthalmus dipes. The 24 hrs LC$_{50}$ value for textiles industrial effluent was observed in the Waterflea, Daphnia magna (Verma, et al., 2006). Patnaik and Patra (2006) observed LC$_{50}$ of sevin at 15.3mg/l. on the fish Clarious batracus.

Saksena (1981) have reported 96 hr. LC$_{50}$ value of mercuric chloride on Clarias batrachus and Puntius ticto at 0.15mg/l and 0.10mg/l. and observed Puntius ticto is more susceptible to the toxicant and has less tolerance than Clarias batrachus.
Toxicity of the effluent mostly depends on the rate of uptake by the animal. The rate of uptake can be determined by the ratio of permeability of body surface with the medium (volume or weight) of the exposed animal. Similar relationship exists between the rate of metabolism and weight of animals Bertalanffy, (1957). The general body surface of the fish is impermeable, but gill epithelium which is always bathed in the medium is one of the routes for the passage of the toxic components of the effluent into the fish. The ratio of surface area of the gill for weight or volume of body decreases with increasing weight of the animal. Therefore, the smaller weight classes of the fish with a greater gill surface body volume ratio are likely to take up the effluent at a faster rate and succumb faster than the larger weight classes.

The high BOD and COD values of the effluent are responsible for the more or less hypoxic condition of the medium Viswananjan (2002). Toxicity of distillery effluent is attributed to high BOD and COD values. Dissolved solids such as chlorides and sulphates of sodium, calcium and copper also partly contribute to the toxicity of the effluent by subjecting them to osmotic stress.

Puvaneswari and Karuppasamy (2007) have reported the LC$_{50}$ values for 24, 48, 72 and 96 hrs at 141.90, 138.35, 134.12 and 131.82 mg Cd L$^{-1}$ on the fish Heteropneusts fossilis. This result indicates that the mortality of test fish was dose and time dependent. Sprague, (1969) observed acute toxicity in single species and single toxicants in relation with on the size, age and condition of the test species with environmental factor.

Many workers made their contributions on toxicity studies Shukla, et al.,(2004) showed relative toxicity of cadmium, copper and zinc in fish Channa punctatus. Vasalt and Patil, (2005) observed mortality of the test fish was dose dependent. Pande and Sakesna, (1992) have reported histopathological changes in the kidney and intestine on the fish Labeo rohita to the exposure of sublethal concentration of copper sulphate. Saksena and bhatnagar, (1981) studied on
toxicity and range of tolerance of mercury, cadmium and lead on freshwater fish *Puntius ticto*.

Jabde, *et al.* (2007) have reported LC$_{50}$ values of cypermethrine for 24, 48, 72 and 96 hr at 0.06, 0.05, 0.04 and 0.03 ppm respectively in the fish *Nemachelius botia*. Joshi and Chamoli (1987) reported that Zinc sulphate was highly toxic to hill stream fish *Naemachelius mountainus*, and determined median tolerance limit values for 24, 48, 72 and 96 hrs at 2.3, 1.5, 0.95 and 0.62 mg/l respectively.

Vutukuru and Rao (2000) reported acute toxicity of hexavalent chromium to the fish, *Sarotherodon mossambicus* and noted LC$_{50}$ value for 96 h at 38.14mg/l. Lohar (2000) reported on comparative toxicity of four heavy metals in freshwater fishes, *Labeo rohita*, *Catla catla* and *Cyprinus carpio* for chromium copper, zinc and nickel. The LC$_{50}$ values for 24 hr. for chromium, copper, zinc and nickel in *Labeo rohita* were noted at 63.2mg/l, 80.1mg/l, 102.5mg/l and 103.4mg/l. *Catla catla* 80.3mg/l, 94.5mg/l, 94.5mg/l 112.6mg/l and 142.3mg/l and *Cyprinus carpio* were reported at 55.9mg/l 92.7mg/l, 134.4mg/l and 160.6mg/l respectively.

Babatunde *et al.*, (2001) reported 96 hr LC$_{50}$ of paraquat to fingerlings of *Oreochromis niloticus* found at 11.84mg/L$^{-1}$. This study interpreted that, the paraquat is highly toxic to *Oreochromis niloticus*. Summers (1980) reported that the Diquat and paraquat have a low level of toxicity to perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*). Kam-wing and Futado (1977) reported mean toxic levels of diaquat and paraquat to guppies as 11.5 and 50mg/L$^{-1}$, respectively and *Rasbora trilineaa* at 7 and 20mg/L$^{-1}$.

Karasu and Koksal (2005) reported the mean of 48 h LC$_{50}$ values of ammonia to fingerlings of *Tilapia* was found at 7.4±0.01mg/l and for larvae 1.009±0.02mg/l. They further reported that *Tilapia* larva has very less tolerant to ammonia than the fingerlings, and sensitivity to toxicant based on the growing
stages of species. Fernandez et al., (1996) observed the 96 hr LC$_{50}$ values of BHC to Fish, Prawn, Clam and Crab were 0.7, 0.0125,13 and 5.8 ppm respectively and reported that fish and prawn were found to be more sensitive to BHC than the Clam and Crab. Walker (1971) obtained a 96 hr. LC$_{50}$ at 0.038 and 0.150mg/l for the rainbow trout and gold fish respectively using y-benzene hexachloride. Bhatia (1971), obtained, LC$_{50}$ value at 9.5mg/l for 96 hrs of active ingredient of BHC for the fish *Cirrhinus mrigala*.

Dairy effluent contains casein, lactose, fat and inorganic salts, these all contribute high biochemical oxygen demand (BOD) and chemical oxygen demand (COD). Dairy effluent decomposes rapidly and depletes oxygen immediately resulting in anaerobic condition causing stress on fish. This oxygen depletion increase lethality of the fish.

Das and Misra (1982) observed LC$_{50}$ value for 24, 48 72 and 96hr. of MEMC to the fish *Cyprinus carpio* at 0.677, 0.358, 0.250 and 0.205 mg/l respectively. They reported that, MEMC was more toxic even at low concentration, to *Cyprinus carpio*. The LC$_{50}$ value for 96hr in *Window Tetra* found at 0.32mg/l$^{-1}$. Amminikuty and Rege (1978).

Singh et al.,(2004) reported that cadmium was more toxic than lead as inferred by their LC$_{50}$ values as LC$_{50}$ value of cadmium chloride for 24, 48, 72 and 96 hr at 687.38, 653.99, 632.78 and 589.76 mg/l and for lead nitrate at 796.57, 740.17, 694.39 and 681.68mg/l respectively to the fish *Labeo rohita*. Svecevicius (1999) reported the 96hrs LC$_{50}$ value of zinc to the five fish species ranged of 3.79-11.37mg/l, in which lowest LC$_{50}$ of 96 hr was found in rainbow trout and highest one in roach. This study indicates the comparative sensitivity of the fish to the toxicant *Oncorhynchus mykiss* >*Gasterostus aculeatus* > *Rutilus rutilus* > *perca flaviatilis* > *Leuciscus leucuscas*.
Toxicity tests are a basic tool for ecological risk assessment of toxic compounds. To increase the reliability test results, both the control and experimental conditions can be improved and the variance of test media can be analyzed with statistics. The statistical tool, which has been used in the present study, is regression analysis with the help of which estimation or production of the known values of another variable could become possible.

Toxicity evaluation work gives about the importance of study of acute and chronic effects of toxicants on non target species increases exposure. The findings from the present study positively coincide with earlier findings to some extent.