REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) ISSN: 2249-894X
VOLUME - 1 | ISSUE - 3 | MARCH - 2019

TOXICITY OF IMIDACLOPRID INSECTICIDE INFLUENCED BY PH. & TEMPERATURE ON THE FRESHWATER FISH RASBORADANICONIUS (HAM.1822)

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ABSTRACT :

The influence of pH and temperature on the toxicity of Imidacloprid has been evaluated by using fresh fishes. Each pH and temperature was found to have an effect on considerably the toxicity of insecticide by altering the physiological responses of fishes leading to mortality. The adverse effects of the pH and temperature were reduced oxygen consumption, acceleration of chemical process, impaired respiratory activities, low energy liberation and then on. Normally these environmental factors might ¬lead to the next level of bioaccumulation of the harmful chemicals, therefore inflicting the chemical stress, that touching the normal functioning of the body.

Key words: *Rasboradanoconius,Imidacloprid insecticide, pH, Temperature and Mortality.*

INTRODUCTION

To protect crops and seeds from pests, about three billion tons of pesticides are applied annually in to agricultural fields worldwide (Pimentel D 2009). All such poisonous pollutants reach to the freshwater bodies through via runoff, spray drift and activity. Imidacloprid is one among the world's popular insecticides that belongs to the chemical group of neonicotinoid insecticides (Jeschke P .2010). Neonicotinoids have selective toxicity for insects and act by binding to the nicotinic acetylcholine (ACh) receptors within the receiving nerve cells of the central nervous system (Jeschke P.2008), (Abbink J. 1991) toxicity of those insecticides is low in mammals as a result of they have lower numbers of nicotinic receptors with high affinity to neonicotinoids(Tomizawa M, Casida JE 2003). Imidacloprid has a great potential to reach water bodies as it is a relatively high water solubility (610 mg/L in 20°C H2O; log Kow = 0.57) hence several studies have reported thepresence of imidacloprid in surface waters (Starner K, Goh K 2012), (Kreuger J. 2010) where it may affect non-target organisms such as Gammaruspulex (Crustacea, Amphipoda, Gammaridae). The concentrations of imidacloprid in surface waters in Kingdom of Sweden reported byKreuger and coworkers (max. 15 µg/L) (Kreuger J. 2010)are below deadly acute toxicity levels in G. pulex (50% of the check people die when constant exposure to 270 µg/L for four days (Beketov M. 2008) However, the lower concentrations found in water bodies would possibly cause sublethal effects. In aquatic ecosystems pH and temperature are important environmental variables which adversely affect the fish and fisheries (Brown, D.J.A 1982), and (Boyd, C.E 1982) has recorded that the health of fishes is mostly influenced by the pH, which would affect the reproduction and growth of fishes. Temperature is one of the most fundamental stressors altering the biological systems. This is as a result of the water quality is greatly tormented by temperature, pH, hardness etc that influence the speed of bioaccumulation of the pollutants Literature ar on the market in lots with reference to pH and hardness (S.Karthikeyan. 2007) But limited reports are available on the toxicity of pollutants in relation to temperature, in aquatic organisms (John, P.R. 1996), (P.Kannadi.

2008). The interaction of pH and temperature related to insecticides are seldom let known and the role of these influencing factors on insecticide toxicity is not elaborated. Therefore the present investigation has been made to evaluate the influence of pH and temperature with reference to imidacloprid toxicity in the freshwater cat fish *Rasboradaniconius.*

MATERIALS AND METHODS

The experimental fishes collected from native reservoir and acclimatized to the laboratory conditions for seven days in dechlorinated water contained in glass aquaria by using 0.5% acetone; the stock solution of 1 chronicles Imidacloprid was prepared. The stock solution was accustomed prepare totally different concentrations like 1 Chronicles, 2%, 3%, 4% and 5%. In every concentration a bunch of ten fishes having a similar weight and size were introduced. The mortality of fish was recorded in every concentration of the insecticide at an interval of 24 hours up to 96 hrs (Table-1). From this the LC_{50} 96 hrs concentration was accustomed study the impact of pH and temperature on the toxicity of insecticide.

A healthy fish of acknowledged weight and size was exposed to the insecticide contained in a rectangular jar. The time at which the fish died was recorded (survival time) at temperature.

Another test animal of an equivalent size and weight was taken within the insecticide medium contained in a beaker that is kept in a water bathtub. The temperature of the pollutant medium was raised by 2°C on top of the room temperature by adding hot water to the water bathtub. currently the survival time of the animal was recorded. Another test animal was treated within the insecticide medium in a similar manner and its temperature was reduced by 2°C below the room temperature by adding ice cold water. The survival time of the animal in the reduced temperature conjointly recorded.

In another set of experiments, the test animal was exposed to the insecticide medium to identified pH and therefore the survival time was recorded. Then the pH of the insecticides was reduced by using pH tablets and another test animal was introduced into it. Equally the pH of the insecticide was raised and also the survival time of the test animal in this pH was noted. The results were tabulated and mentioned (A.Parithabhanu. 2014).

RESULTS AND DISCUSSION

Temperature is one among the necessary factors because it greatly affects the toxicity of neonicotinoid chemicals (Table-2). The ever-changing temperature might increase or decrease or cause an impact on the toxicity of the chemicals depending on the species and therefore the chemical nature of the poisonous. the current study the insecticide exerted additional harmful impact at extreme temperature. A high temperature of the insecticide medium may have reduced the oxygen content. in order that the fishes died because of decrease in oxygen consumption at high temperatures additionally detected by (Rafia Sultana. 1995), (Gupta, A.K. 1991) have found that the fishes were more susceptible to the metals at high temperature. (Orr, T.R. 1955) Have determined that the heat death in animal is because of death of various tissues, consecutive at totally different temperature.

According to (C.Ladd Prosser. 1965) the chemical reactions are accelerated because the temperature rises whereas the cardiac and respiratory activities are slowed down leading to hypoxia in fishes at lower temperature. In *Rasboradaniconius* the lowered temperature of the insecticide medium exhibited mortality as a result of the rate of energy liberation might be inadequate for the maintainace of metabolism once the temperature of the body lowered. Within the present study the temperature may have an effect on the nervous system directly altering the input of impulses of fishes through skin thermo receptors.

The pH of the medium conjointly extremely alters the toxicity of chemicals through the impact on physiological responses of the organisms, as pH causes a severe chemical stress (Table 3). (Packer and Packer, R.K.1972) have reported that the elevation of pH can lead the acidosis in fishes that may decrease the oxygen carrying capability of blood. (Drummond, R.A .1974) has shown that the metal accumulation has been raised at higher pH of the medium. On the opposite hand lowering of pH has also been shown to extend accumulation of metal in fishes (Paulose.P.V 2004). In lower pH this experimental fishes might have

experienced increased bioaccumulation of the poisonous substances by the uptake through gills. a similar trend has conjointly been detected (Paulose. P.V 1989) in fishes exposed to toxicants. (Robert.L. 1984), (Stephenson, M. 1988) have reviewed the precise impact of pH on bioaccumulation in fresh water invertebrates underneath acidic condition more energy is found to be needed to keep up normal functioning of animals (Rosseland, B.O. 1994) oxygen uptake is found to be impaired in organisms (Spry,D.J Wood. 1981). therefore from this investigation it's evident that the chemical toxicity has been extremely influenced by the interaction between the pH and temperature in fishes under laboratory conditions. This laboratory experiments are extremely helpful to correlate and justify the dynamics of pollutants in normal atmosphere under the influence of pH and temperature.

TABLE 1: Toxicity of various concentration insecticide Imidacloprid on*Rasboradaniconiousduring* various exposure period.

Concentration of the insecticide	Mortality			
	Exposure Period (Hours)			
	24 Hrs.	48 Hrs.	72 Hrs.	96 Hrs.
Control	0	0	0	0
1	0	10	20	30
2	0	20	30	40
3	0	20	40	50
4	10	40	60	90
5	10	50	80	100

TABLE 2: Effect of temperature of the toxicity of insecticide.

Sr.No	Tempureerat	Survival Time (minutes)
1	25°C	**95**
2	30°C	**55**
3	35°C	**25**

TABLE 3: EFFECT OF pH ON THE TOXICITY OF INSECTICIDE.

S.NO.	pHvalues	Survival Time(Minutes)
1	6.0	70
2	7.0	65
3	7.7	35

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