



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Studies on Bioecology and Effect of Agricultural Pesticide

Pyrethroid on Certain Enzymes on Non-Target Wildlife Species *Hoplobatrachus Tigerinus* (Indian Bullfrog) from Bihar

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Abstract: The red list of species under threat of extinction, complexed by the species survival, Commission Of The International Union of The Conservation of Nature, indicates that the current extinction rate of amphibians is roughly 1,000 times higher than any other time in their 360 million year history. The survival of amphibians is crucial to the future of our planet. Amphibians are good indicators of the general health of ecosystem. They can be key to the food chain and act as a critical form of pest control. Frogs are highly important for developing some medical treatments, including potential treatments for cancer and AIDS, pain killers and new kinds of antibiotics. Frogs act as an early warning system for us about health of our planet.

Index Terms - Bioecology, Agricultural, Enzymes, Wildlife, *Tigerinus*.

Introduction :

The variety of life on earth, its biological diversity is commonly referred to as biodiversity. It has long been feared that human activity is causing massive extinctions. Despite increased efforts at conservation, it has not been enough. and biodiversity losses continue. It is estimated that current rate of extinction is greater than any known in the last 100000 years (Eldridge, 1998).

The world has now moved into the phase of amphibian extinction rather than the question of decline and 32% of all amphibians are threatened with extinction (NZFROG, 2006).

The red list of species under threat of extinction, complexed by the species survival, Commission Of The International Union of The Conservation of Nature, indicates that the current extinction rate of amphibians is roughly 1,000 times higher than any other time in their 360 million year history. The survival of amphibians is crucial to the future of our planet. Amphibians are good indicators of the general health of ecosystem. They can be key to the food chain and act as a critical form of pest control. Frogs are highly important for developing some medical treatments, including potential treatments for cancer and AIDS, pain killers and new kinds of antibiotics. Frogs act as an early warning system for us about health of our planet (Moreno, 2012).

Amphibians represent the prime example of the modern biodiversity crisis since they are the most threatened and rapid declining vertebrate group, disappearing from different habitats on global scale (Stuart et al., 2004).

The potential causes of extinction are numerous and include habitat destruction and loss (Dunson et al., 1992), climate change (Pounds et al., 1999), and contaminants (Relyea, 2005).

While the pesticides have the potential to affect many aquatic taxa, the impacts on amphibians are of particular concern in the past decades because of the apparent global decline of many species (Blaustein and Wake, 1990; Houlihan et al., 2000).

In the prevailing global scenario of amphibians, it is imperative to estimate direct toxicity of pesticides for their rescue. The pesticides, organophosphate carbamate are widely used and various sublethal and lethal effects on non target wild life species are documented (Parsons et al., 2000; Khan et al., 2003). Pyrethroid insecticide, having reputation as safe insecticide is being used widely in agriculture fields, in waterbodies and in houses. There is some indication however, that field application of these pesticides may be deleterious to amphibians (Berril et al., 1993; Materna et al., 1995).

Pyrethroids are synthetic variations of naturally occurring pyrethrum (extracted from chrysanthemum flower) being used as insecticide since first century. Pyrethroid was introduced in the late 1900s, and like all toxins it affect all organisms that come in its contact. It is endocrine disruptor, neurotoxic and a known carcinogen (Kaplan, 2013).

The consumption of synthetic pyrethroid in India increased by over 42% during the last five years. The species *Hoplobatrachus tigerinus* is found throughout most wetland of India is highly prone to the effects of pyrethroid toxicity. The animal is finally included in schedule IV of the Indian Wild Life (Protection Act) and is listed in appendix II of CITES. It is predicted that the population of this species, bullfrog might decline in near future because of water pollution and habitat loss.

Literature Review :

Angels and Jenssen (2006), investigated effects of P, P-DDE on amphibian endocrine system and showed significant variation in the liver retinal concentration with increasing dose and suggested that the pesticides interference in the hepatic metabolism might have caused adverse effects.

Fenoglio et al. (2006) studied the epidermis of *Rana esculenta* collected from relatively unpolluted and heavily polluted rice field. His observation showed that the frogs inhabiting heavily polluted rise fixed developed morpho-functional plasticity on frog epidermis in response to environmental contamination.

Cassano et al. (2006) observed decline in amphibian population due to presence of atrazine in agricultural sites.

Barni et al. (2006) observed changes in some circulatory blood cells in *Rana esculenta* collected from heavy polluted areas.

Murphy et al. (2006) examined sediment TCDD-EQS and MROD activities in ranid frog from non agricultural and agricultural sites and found adverse effect on frogs collected from extensive corn cultivation field. Summer (2003) observed adverse effect on the amphibian due to atrazine concentration in agricultural sites.

Mann et al., 2009; Hayes et al., 2006, reported that crop lands receive high chemical inputs to control pests, weeds and fungus infection leading to pesticide exposure, which could be an important drive for the observed amphibian decline.

Pruhl et al. (2011), suggested that for terrestrial amphibian life stages present in crop fields pesticides uptake through the skin might represent a likely exposure route.

Bruhl (2013) observed mortality of juvenile European common frogs due to the two pyraclostobin formulations, Besides the above workers the findings of Arukwe (2006);

Josephjohn et al. (2004), Boily et al. (2005) have recorded adverse effect of contamination on the amphibians which make the world aware of the declining trend of amphibians, which attracts global attention towards the protection of wild life without further loss of time.

Need of the study:

Amphibian declines have forced many species to the brink of extinction. Since 1980, 122 species are traceless or may have disappeared. About 300 out of remaining 600 species are threatened. It is predicted that 500 species may face extinction in the next five to six decades. IUCN, considers pollution as one of the factors for amphibian decline. According to emeritus Professor Q.M. University London, "there are ways in which some of the pesticides might have a mechanism of action that would affect amphibians, these will differ between compounds and so would need examining carefully". Pyrethroids are popular pesticides, that are applied in the agricultural fields of Bihar, where Indian bullfrog, *Hoplobatrachus tigerinus* species inhabits naturally. Hence the study on bioecology and the effect of agricultural pesticides pyrethroids on certain enzymes in the said species is needed for enhancing knowledge for their rescue from predicted extinction in the current world.

Scope of the Study :

Amphibians represent the best example of the modern biodiversity crisis since they are rapidly declining group of vertebrate and disappearing from their different habitats on a global scale. Amphibians are exposed to both terrestrial and aquatic life. Aquatic involvements receive pesticides by spray drift or runoff. Pyrethroids, the agricultural pesticide commonly used in the different parts of Bihar following national and global trend. The present study may illuminate a possible connection between the pyrethroid pesticide and its effects on Indian bullfrog, *H. tigerinus* living in contaminated habitat. The present study may add to the knowledge about the interference of pyrethroids with the physiological processes at tissue level in vital organs of *H. tigerinus*.

As amphibians are considered sentinel for numerous aquatic organisms and human health, hence the present study may expand the scope protecting non-target wild life of this region of Indian.

Objective of the study :

The objective of the study is to assess the bioecology of Indian bullfrog *H. tigerinus* in Bihar region and to estimate the effect of pyrethroid on agricultural pesticide on the enzyme cholinesterase and alkaline phosphatase in the tissues of liver, kidney and brain of the non target wild life frog.

Research Methodology :

1. The preferred amphibian *H. tigerinus* to be procured from a wetland situated near an agricultural field of Darbhanga (Bihar). The collected bull-frogs to be transferred in water filled glass aquaria in C.M. Sc. College Research Laboratory with proper feeding and acclimatization.
2. Temperature and humidity, to be recorded by thermometer and hydrometer.
3. Pyrethroid formulations to be prepared in water and to be injected subcutaneously mostly in abdominal region with the help of a syringe.
4. After 24 hour post treatment enzyme cholinesterase and alkaline phosphatase to be estimated from liver, kidney and brain tissues following Shakoori and Ahmad (1973) technique.
5. Cholinesterase activity to be estimated by Randox kit no. C.E. 190.
6. Alkaline phosphate activity to be estimated by Randox kit no. AP 307.

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