



**INTERNATIONAL JOURNAL OF RESEARCH –
GRANTHAALAYAH**
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**HOW TO REDUCE IMPACT OF PESTICIDES IN AQUATIC
ENVIRONMENT**

(A Review Article)

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ABSTRACT

Aquatic animals and aquatic resources are valuable natural assets. Aquatic animals give higher productivity and protein yield as compared to agriculture or animal husbandry and have less energy expenditure for food production. Besides protein, fish flesh contains sufficient quantity of vitamins and minerals, which are essential for growth. Aquatic animals enhance national economy and provide financial benefits by employment, profit and money savings. Sea food industry provides jobs for commercial fishers, wholesaler and retailers.

The rapidly increasing use of pesticides in agriculture, poses serious danger, both to the public health, fisheries and aquatic ecosystem. Pesticides enter in aquatic ecosystem causes undesirable loss in the form of pathology or mortality of aquatic animals, which causes decline of aquatic micro-organisms, fish and other aquatic species, like prawns, frogs, turtles, muscles, water birds etc. These aquatic animals are main source of natural food chains. If flesh of these insecticides accumulated animals, eaten by other animals and by men, are also affected by these pesticides.

Pesticides must be used with great care, so that the health of humans, animals and the environment are protected. Disadvantages of pesticides include their toxicity to some humans, animals and useful plants, and the persistence (long life) of some of these chemicals in the environment, which causes serious hazard both to the public health and the environment.

Keywords:

Pesticides, aquatic animals, bio diversity, commercial fishers, national economy.

INTRODUCTION

Appreciation of fisheries and aquatic systems has been accompanied by increasing concern about the effects of growing human populations and human activity on aquatic life and water quality. Pesticides are one group of toxic compound linked to human uses that have a profound effect on aquatic life and water quality.

The economic importance of aquatic animals and pesticides for the betterment of the human beings is obviously known and tested. These pesticides behave as pollutants, when viewed for the ecosystem, environment and non-target organisms. More than 1000 pesticides currently used in most of the countries inadvertently reach the aquatic ecosystems through (1)- surface runoff of pesticides used in agriculture and forestry. (2)- Pesticides from rainfall, accidental spraying, accidental spills and continuous release from industrial wastewater. Water is one of the primary means by which pesticides are transported from application site to environment. (3)- Use of

pesticides to control unwanted aquatic animals or plants, such as lampreys, some imported fishes, mosquitoes, midges, black flies, pond weed, water milfoil, and water hyacinth (Landa and soldan; Rockets and Rusty, 2007).

The objective of this paper is to highlight how to reduce the impact of pesticides on aquatic animals, as to save the bio diversity and aquatic environment so as to reduce the harmful effects on animals and human beings, as well as to save the economy of nation, which is important for development of country.

HOW CAN PESTICIDES BE HARMFUL TO ECOSYSTEMS

Pesticides poisonings of people, livestock, and wildlife have occurred when proper care was not taken. Pesticides applicators must be very careful to avoid these risks. Mishandling of pesticides can lead to

- Reduced control of the target
- Injury of non-target plants and animals
- Environmental damage.
- May disrupt the natural balance in ecosystems

AQUATIC TOXICOLOGY

Aquatic toxicology is the study of the effects of environmental contaminants on aquatic organisms such as the effect of pesticides on the health of fish or other aquatic organisms. A pesticide's capacity to harm fish and aquatic animals is largely a function of its (1) toxicity (2) exposure time (3) dose rate and (4) persistence in the environment.

Toxicity of the pesticide refers to how poisonous it is. Some pesticides are extremely toxic, whereas others are relatively nontoxic. Exposure refers to the length of time, the animal is in contact with the pesticide. A brief exposure to some chemicals may have little effect on fish, whereas longer exposure may cause harm to them.

The dose rate refers to the quantity of pesticide to which an animal is subjected (orally, dermally, or through inhalation). A small dose of a more toxic chemical may be more damaging than a large dose of a less toxic chemical. Dosage can be measured as the weight of toxicant per unit (kilogram) of body weight (expressed as mg pesticide/kg of body weight) or as the concentration of toxicant in the water or food supply (usually expressed as parts per million, ppm or parts per billion, ppb). A lethal dose is the amount of pesticide necessary to cause death. Because not all animals of a species die at the same dose (some are more tolerant than others), a standard toxicity dose measurement, called a lethal concentration 50 (LC50), is used. This is the concentration of a pesticide that kills 50% of a test population of animals within a set period of time, usually 24 to 96 hours, (Helfrich,2009).

PERSISTENCE OF PESTICIDES

Some pesticides can remain in the environment for many years and pass from one organism to another. Uptake and accumulation of pesticide by aquatic organisms seem to be more likely a function of habitat, habits, life cycle and exchange equilibrium than of food uptake, size of organisms, pharmacokinetics, and physical and chemical properties of the pesticide (Muirhead, 1971; Rosenberg, 1975)

Persistence refers to the length of time a pesticide remains in the environment. Degradation of pesticide depends on its chemical composition and the environmental conditions. They can be degraded by sunlight (photo decomposition), high air or water temperatures (thermal degradation),

moisture conditions, biological action (microbial decay), and soil conditions (pH). Long lasting pesticides break down slowly and may be more available to aquatic animals, (Deepa et.al Ecological effects of pesticides. www.intechopen.com).

HOW CAN PESTICIDES BE HARMFUL TO ECOSYSTEM HOW FISH AND AQUATIC ANIMALS ARE EXPOSED

1. Dermally- Direct absorption through the skin.
2. Breathing- uptake of pesticides through the gills
3. Orally- by drinking pesticide-contaminated water or feeding on pesticide- contaminated prey. Poisoning by consuming another animal that has been poisoned by a pesticide is termed 'secondary poisoning'.

TOXICOLOGICAL EFFECTS

Mikhali et.al. (2013), reported that the pesticides are responsible for reducing regional bio diversity of aquatic insects and other fresh water invertebrates. Decrease in bio diversity is primarily due to the disappearance of several groups of species that are especially susceptible to pesticides. These are stoneflies, may flies, caddis flies and dragonflies, which are important members of food chains right up to fish and birds. These disappeared species are responsible for sustainability of biological diversity of aquatic environments because they ensure a regular exchange between surface and ground water, thus functioning as an indicator of water quality.

Applications of herbicides to water bodies can cause fish kills when the dead plants rot and use up the water's oxygen, suffocating the fish. Some herbicides, such as copper sulphite that are applied to water to kill plants are toxic to fish and other water animals at concentrations similar to those used to kill the plants, repeated exposure of some pesticides can cause physiological and behavioural changes in fish that reduce populations, decreased immunity to disease, (Helfrich et al, 1996).

Histopathological effects of pesticides in fishes have been studied intensively. Pathological changes occur mainly in the liver, gonads, brain, Lakhani 1983; kidneys, and endocrine glands and in gills, (Velmurugan 2009). Some insecticides induced abortions, reported by Boyd in 1964.

HOW TO REDUCE THE RISK

- Use a pesticide only when necessary.
- Use less toxic pesticides.
- Use safe/Sensible application method.

BEST MANAGEMENT PRACTICES (BMPS) FOR PROTECTING WATER QUALITY

- Science based holistic environmental management approaches aimed at reducing the possibility of pesticides and other chemicals and sediments of moving off treated areas into receiving water bodies.
- Control the rate, method timing and type of chemicals being applied.
- Use the appropriate pesticide rates. Use as needed only and eliminate routine maintenance programmes.
- For pesticide application adopt an integrated pest management (IPM) approach to use the least amount and least toxic of pesticides possible to achieve acceptable pest control.

SELECTION OF PESTICIDES BASED ON

- Lowest toxicity of humans, mammals, fish, birds and other invertebrates.
- Acute toxicity should be low.
- Higher soil absorption, lower water solubility, shorter half-life.
- The most persistent, the greater chance of off-site movement via runoff.

PESTICIDE AND FERTILIZERS SHOULD HAVE

- Low runoff potential e.g. Liquid applications rather than granular formulations of pesticides.

METHODS AND TIMING

Application of pesticides should be avoided just before anticipated rainfall events or when soil moisture conditions are high, or when very windy.

Prevent runoff by managing irrigation so application rates do not exceed infiltration capacity of the soil.

Application of pesticides should be restricted in an area that is greater than can be quickly and efficiently watered in.

USEFUL WEBSITES TO LEARN ABOUT PESTICIDE PROPERTIES

- National Pesticide information Centre (NPIC) <http://npic.orst.edu/>
- Crop Data Management System (CDMS) database <http://www.cdms.net/>
- Extension Toxicology Network <http://extoxnet.orst.edu/>

CONCLUSION

Pesticides often considered a quick, easy solution for controlling weeds and insect pests, however, their use comes at a cost

- Pesticides damage ecosystems
- Pesticides may damage or harm un-targeted animals
- Pesticides decrease biodiversity
- Pesticides may cause a decline in populations or even cause extinction of species.
- Pesticides “mess up” food chains/Webs
- Pesticides disrupt the natural balance in ecosystems.

Therefore it should be necessary to minimize the after effects of pesticides through BMP practices and an overall reduction in reliance on chemical pest control.

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