

Pesticides and Its Impact on Biodiversity and Environment

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Abstract- *Pesticides are the biological toxicants, which are being used by the man to kill the pests for increasing the yield of many crops and insect vectors to control the spread of disease. The use of pesticides has caused severe environmental and health hazards to organisms including human beings. Excessive use of pesticides may lead to the destruction of biodiversity. Many birds, aquatic organisms and animals are under the threat of harmful pesticides for their survival. This article intends to discuss about pesticides and their ill impact on biodiversity and environment.*

Indexed Terms- *Pesticides, Biodiversity, Environmental hazards.*

I. INTRODUCTION

Pesticides are biological toxicant that are deliberately released into the environment in order to kill, prevent, deter, control, destroy, repel or mitigate population of insect, weeds, rodents, fungi, or other harmful pest in agricultural, domestic and industrial setting. In agricultural field the use of pesticide has become a common practice to increase the crop yield through controlling pest and insect vector to control the spread of pest related disease (Prakash and Verma, 2014). The main groups of commonly used pesticides are insecticide, fungicides, fumigants, and rodenticides.

The use of pesticides increased many fold over the past few decade. It is estimated that about 5.2 billion pound of pesticide are used worldwide annually (Dutta and Bortamuly, 2018). Majority of pesticide are not particularly targeting the pest. The widespread use of pesticides not only brought adverse influence on agro ecosystems but also caused alteration in physiological processes of non-target organisms (Verma and Prakash, 2018). It has been assess that only about 0.1%

pesticide stretch out the target entity and remaining are taint with the surrounding environment (Dutta and Bortamuly, 2018). Poisoning risks depend on dose, toxicity, duration of exposure and sensitivity (Prakash, 2020).

The over and misuse of pesticide has precedence to immense health problem, economic loss and various environmental problem. The resultant health problem of pesticide includes cancer, birth defect, reproductive problem, liver, kidney, and neural problem etc. In many developing countries majority of pesticide are associated with adverse effect on human health and environment due to the in judicial use of pesticide. On the other hand the overused of pesticide also precedence to the environmental pollution such as water, soil pollution etc and cause imbalance of ecosystem.

Synthetic pesticides are widely used in India to increase the production of crops. It is also used in public health application to control insects such as cockroaches, mosquitoes, ticks, and flies which may act as a disease vector (Kaur and Mishra, 2019). The main aim of present study is too look out the effects of pesticides on public health, biodiversity and environment.

II. EFFECTS OF PESTICIDE ON ENVIRONMENT

Mostly farmers and field workers are illiterate or they less educated and they hence applied pesticides without screening and proper specific information, due to which various hazardous effect posed on environment. Multitudinous use of pesticide without screening on daily basis also affects the non-target organism. Due to irregular screening sometimes, they used pesticide abundantly after damaging the crop.

Ultimately those are persisting for long time in the environment and causes environmental pollution specially soil pollution. The innumerable use of pesticides also kills the helpful microorganism as a result of which the self-fertility property of soil is reduced. Regarding pesticides it is important to have practical understanding of their physical and chemical properties, since their solubility determine the transportation of surface runoff and absorbing capacity of soil (Bernardes *et al.*, 2015). In environment the pesticides are tempo rated long distance and their deposition to water causes water pollution. In several cases pest are resistances to a particular pesticide as effect of natural selection, which cause hazards to non-target organism and cause sudden death of that organism. On the contrary, the pesticides which are demoted through photodecomposition, microorganisms, or through physical or chemical reaction. But the un-demoted pesticides are remaining on environment over long time which greatly causes environmental damage. The long-time persisting pesticide causes hazards to biodiversity of aquatic or terrestrial organism. Pesticides are entered to aquatic ecosystem that act as toxic agent and causes hazard to aquatic plant and animal.

III. EFFECTS OF PESTICIDE ON BIODIVERSITY

Biodiversity is the 'foundation of human life' on earth and for human's survival and sustainable development; it must be maintained at any cost (Verma and Prakash, 2020a) but environmental ethics should not be avoided (Verma, 2019). The biodiversity helps in maintaining the ecological balance and the ecological balance is an indispensable need for human survival (Ashok, 2017 & 2018).

Pesticide effects on the populations of aquatic and terrestrial plants as well as animals including birds. Accumulation of pesticides in the food chains is of greatest concern as it directly affects the predators and raptors. But, indirectly, pesticides can also reduce the quantity of weeds, shrubs and insects on which higher orders feed. Spraying of insecticides, herbicides and fungicide have also been linked to declines in the population of rare species of animals and birds.

Pesticides enter into the water bodies like ponds and rivers which alters the physicochemical properties of water and is toxic to aquatic organism and pesticide contaminated water poses a great threat to aquatic form of life. It can affect aquatic plants, decrease dissolved oxygen in the water and can cause physiological and behavioural changes in fish populations. About 80 % of the dissolved oxygen is provided by the aquatic plants and it is necessary for the sustenance of aquatic life. Killing of aquatic plants by the herbicides results in drastically low oxygen levels and ultimately leads to suffocation of fish and reduced fish productivity. However, pesticides reach underground through seepage of contaminated surface water, improper disposal and accidental spills and leakages.

Pesticides which are applied to land drift to aquatic ecosystems and there they are toxic to fishes and non-target organisms. These pesticides are not only toxic themselves but also interact with stressors which include harmful algal blooms. With the overuse of pesticides, a decline in populations of different fish species is observed (Scholz *et al.*, 2012). Pesticides have been found toxic for several amphibian species, whereas, herbicide glyphosate is known to cause high mortality of tadpoles and juvenile frogs (Relyea, 2005). Aquatic animals are exposed to pesticides in three ways: Dermally (Direct absorption via skin), Breathing (Uptake via gills during breathing) and orally (entry via drinking contaminated water effects of pesticides on environment).

Pesticide exposure can also cause sub-lethal effects on terrestrial organism in addition to killing non-target organisms. Populations of beneficial insects such as bees and beetles can significantly decline by the use of broad-spectrum insecticides such as carbamates, organophosphates and pyrethroids. Insect population has also been found to be greater on organic farms compared to non-organic ones. Since 2006, each year, honey bee populations have dropped by 29–36 %. Since pre-agricultural times, 20–25 % of the bird populations have declined. One of the major causes of this massive decline is the use of pesticides which was not known before 1962. Pesticide accumulation in the tissues of bird species leads to their death. Bald eagle populations in the USA declined primarily because of expo-sure to DDT and its metabolites (Liroff, 2000).

CONCLUSION

Pesticides have proved to be a boon for the farmers as well as people all around the world by increasing agricultural yield and by providing innumerable benefits to society indirectly. On the contrary those cause adverse effect to environment such as pollution and causes imbalance of ecosystem. Those problems regarding pesticide are occurring due to the improper knowledge, unaware about pesticide types, level of poisoning, lack of daily screening and awareness about their harmful effect on environment and health. But the issue of hazards posed by pesticides to biodiversity and the environment has raised concerns about the safety of pesticides. The enormous use of pesticide becomes the predominant environmental contaminants. Once these pesticides are released in the environments they are metabolized in short time where as other persists over longer period and can accumulate in the soil and water and badly influence the biodiversity (Prakash and Verma, 2020).

Although we cannot completely eliminate the hazards associated with pesticide use, but we can circumvent them in one way or the other. Exposure to pesticides and hence the harmful consequences and undesirable effects of this exposure can be minimized by several means such as alternative cropping methods or by using well-maintained spraying equipments or by using pesticides of plant origin. Reduction in anthropogenic activities including pesticide use during Covid-19 and lockdown, imparted positive impacts on biodiversity and environment (Verma and Prakash, 2020b; Roy and Chaube, 2021).

The bitter experience of the use of synthetic pesticides and presence of rich flora in our country attracts the attention of scientists to develop an effective and economic control method by exploring the bio pesticides (Ansari *et al.*, 2004a). So, it has become necessary to evolve control measure, which may be selective in action and relatively harmless to non-target organisms and human beings (Ansari *et al.*, 2003). Thus, pesticides of plant origin are preferred over synthetic pesticides because of nontoxic to environment and human beings (Ansari *et al.*, 2004b). In the current scenario of increased human population, it is a big challenge before us to save the biodiversity (Kumbhar and Mhaske, 2020; Chakraborty *et al.*,

2021; Arya, 2021). The effects of pesticides are lessen by organizing awareness program among the farmers, gave special training to them regarding consequences of pesticides, their screening and monitoring methods.

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