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Impact and management of pesticides in agriculture: A review

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Abstract

The excessive use of pesticides has generated increasing concerns about the negative effects on human health and the environment. Pesticides degenerate soil invertebrates, including nematodes, microarthropods, earthworms and other small organisms that play an important role in soil ecosystems. Pesticides can enter the human body through inhabitation and causes cancer, respiratory and skin diseases. To protect human health and environment hazards associated with pesticides in agriculture and development and usage of safe and friendly pesticide formulations, application of the alternative pest control strategies in an IPM approach such as host plant resistance and bio-control.

Keywords: Pesticides, environment, ecosystem, IPM

Introduction

Food is essential for us to survive in this world. Nowadays, it is very difficult for farmers to get good yield. Many are starving because of increasing population which is also the reason for the increasing pathogen and insects due to improper crop management. The farmers are using pesticides to kill the pests and insects to get a good yield. This will cause great damage to the soil, water and crops, in addition to that it adversely affects human health. According to "FAO"2018, pesticide is any substance or blend of substance prepared for avoiding, devastating, controlling any irrigation including vectors of human or creature ailment, undesirable types of plants or creatures, causing destruction among or generally interfering with generation, preparing, storage, transport or substance that might be directed to animals for the control of bugs or different pests in or on their bodies.

Pesticide Impact

A) Soil Environment

Pesticides directly affect the soil and the microorganisms that are present in the ecosystem. They are easily exposed to the pesticides. Pesticides have both harmful and beneficial on microbes. Some organisms, especially Bacteria obtain nutrients from pesticides to lead its life and some other are very sensitive to pesticides and easily affected. Microbes are essential for biodegradation of pesticides and thereby make the environment clean with less accumulate pollution. The herbicides, such as Trifluralin and Oryzalin inhibit the transformation of symbiotic mycorrhizal fungi (ATSDR, 2002) [1]. The triclopyr inhibit the transformation of ammonia into nitrite (Pell *et al.*, 1998) [5]. Due to inhibition of this process, the plants can't get nitrogen and it will alter the life cycle of plants. Glyphosate, non-selective herbicide reduces the growth and activity of nitrogen fixing bacteria (Santos and Flores, 1995) [6]. Friend of farmer, Earthworm is affected by the over usage of Triazine. The important process of plant like Nitrification and denitrification is disturbed by chlorothalonil and dinitrophenyl. The high concentration of these pesticides results in absorption by plants leading to various ill effects in ecosystem.

B) Aquatic system

Pesticides enter in aquatic ecosystem and causes undesirable loss in the form of mortality of aquatic animals, which result in the decline of aquatic organisms. Endosulfan at 10mg/L, reduced *Calluna vulgaris* growth rate by 15% and growth was completely inhibited in this alga at a higher rate of endosulfan. *Anabaena doliolum*, growth was reduced at all endosulfan concentrations tested and growth stopped completely at concentrations greater than 3mg/L (Mani and Konar, 1988) [4]. In one experiment, Chlorpyrifos reduced dissolved oxygen and increased free carbon di-oxide which causes severe damage to the aquatic organisms.

C) Human health

The use of pesticides has resulted in various cases of acute and chronic poisoning resulting in varying hazard on human health from mild effects to death (Dawson *et al.*, 2010) [2]. Prolonged exposure to the sub-lethal quantities of pesticides result in chronic illness to human. The use of chlorinated pesticides and methyl bromide were associated with prostate cancer among farm workers over 50 years of age which is the second most common cancer in men after lung cancer. The farmers had a high prevalence of chronic dermo-respiratory symptoms such as cough, pharyngitis, bronchitis, asthma, dysuria, sinusitis, nasal irritation and contact dermatitis.

D) Natural enemies

The use of pesticides has resulted in various cases of acute and chronic poisoning resulting in varying hazards on human health from mild effects to death. Prolonged exposure to the sub-lethal quantities of pesticides will result in chronic illness to humans. The use of chlorinated pesticides and methyl bromide were associated with prostate cancer among male farm worker over 50 years of age which is the second most common cancer in men after lung cancer. The organisms that live by preying on other organisms are called as predators. The usage of pesticides in agriculture causes direct loss of insect pollinators and indirect loss of crops because of the lack of adequate populations of pollinators. Many scientists have demonstrated that neo-nicotinoids and other pesticides are a major factor in the decline of pollinator population and unusual instances of excessive bee mortality (Henry *et al.*, 2012) [3].

Mitigation of harmful effects of pesticides

To avoid the harmful effects of pesticides on human health and contamination of food with pesticides, farmers should use alternative methods like integrated pest management (IPM), crop rotation or organic farming. A robust strategy to reduce health impacts include

- A) A community based process of education and provision of personal equipment to reduce exposure;
- B) Educating farmers to enhance agro-ecosystem by understanding the effects of pesticide use;
- C) Organic farming is another viable alternative in mitigating the harmful effects of pesticides. Organic produce contains fewer pesticide residues than either conventionally grown produce or produce grown using IPM techniques.

Conclusion and future prospects

Pesticides have proved to be a boon for the farmers all around the world by increasing agricultural yield and by providing innumerable benefits to society indirectly but the issue of hazards posed by pesticides on the environment and human health has raised concerns about the safety of pesticides. The harmful effects and undesirable consequences can be minimised by alternative cropping methods or by using well-maintained spraying equipment.

Paracelsus also once said that "the right dose differentiates a poison from a remedy". Intense use of pesticides can be reduced by promoting organic farming practices and searching for the bio-pesticides (or) biological agents to control agricultural pests in order to reduce the use of chemical pesticides. This is the time to act, in order to curb the utilization of pesticides to ensure the safety of our environment and ultimately health threats related with it. So,

replacing the outdated management practices is the need of hour.

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