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Use of Pesticides: Causes, Effects and Management

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Abstract

Pesticides are the chemical substances used to control agricultural pests and enhance agricultural productivity. Intensification in agriculture leads over-use of pesticides. Overuse of pesticides has become a serious threat to human as well as environmental health. Although the effect of pesticides is a major subject of concern, an in-depth study on this topic has not been done yet. Lack of awareness among farmers, climate-induced change in pest distribution patterns, pest resurgence, poor regulation, low-quality pesticides, etc. is the major causes of overuse of pesticides. The persistence of pesticide residue in environments and crops leads to long-term negative health hazards to humans, animals, and ecosystems. The proper management of pesticide use through increasing the efficiency towards the specific pest was a prerequisite for the protection of human, animal, and environmental health adulteration. Pest population monitoring, pesticide alternations, proper time and amount of pesticide application, target-specific pesticide application, biological control, pheromones traps, Integrated Pest Management (IPM), and host plant resistance techniques were the major strategies suitable to reduce the hazardous effects of pesticides. Therefore this review addresses the major issue related to over use of pesticides, their causes, and proper management strategies that would help people protect themselves from serious hazards and overall sustainability of the ecosystem.

Keywords: Pesticides; Climate change; IPM

Introduction

Pests are any destructive insects or animals that hamper and cause a serious economic loss of crops and livestock. It also affects lawns, gardens, and woods, and acts as a source of vector to transfer diseases. To minimize this pest damage there is a prior need for the use of pesticides by farmers all around the world. Pesticides are the chemical substances that are used to control, prevent, destroy, or mitigate any pest including disease-causing vectors interfering the production and productivity. Agriculture and health are the two major sectors where the maximum use of pesticides can be observed. Pesticides are more economical, easily importable, and easy to handle and use, making farmers adopt pesticide-dependent farming practices. It also helps to increase efficiency and saves manpower and time. Pesticides can be broadly classified into three categories; Insecticides (used to kill insect pests), Herbicides (used to kill harmful herbs/weeds), and Fungicides [1-3].

Methodology

It is predicted that the population of the world will be ten billion with an increasing annual rate of 97 million by 2050. Food and Agricultural organization had forecasted that the production should be increased by 70% to meet the food demand of the growing population facing climate-changed growing conditions of crops and livestock. The increasing population creates an increasing food demand [4-6]. To meet the food demand, food production should increase at a higher rate than the rate at which the population is increasing which creates tremendous pressure on the agriculture system with limited resources such as land and water. Increasing production level up the use of pesticides from its optimum limit. The use of pesticides provides a certain benefit to the farmers in the short run but in the long run. There was a greater threat of over-use of chemical pesticides to human health as well as the environment, which the farmers were not aware of. It was a major subject of matter to be studied by environment specialists as well as entomologists. No serious thinking due to a lack of knowledge and the harmful effects of pesticides the use of pesticides is increasing even more [7,8]. The major aim of this review is to provide a better understanding of pesticides, their effects, and management that would protect humans as well as the environment to attain the goals of sustainable agriculture as well as organic agriculture [9,10].

Results

Trends showed that pesticides had been used for several years. Firstly physical, mechanical, and cultural strategies were adopted to control the agricultural pests. Before World War II, primitive agronomic practices were used to control pests. Chemicals such as copper or sulfur, and botanicals such as derivatives of plants tobacco, neem, or pyrethrins were used to control the pests. The use of inorganic substances such as sulfuric acid, sodium chlorate, organic substances, and seawater was done until the 1940s. In 1938, Paul Muller identified a potential pesticide Dichloro Diphenyl Trichloroethane (DDT) which won a Nobel Prize used in WWII for mosquito (malaria and Yellow fever) control. Organochlorine (OCL) was the first synthetic insecticide used to control agricultural pests in 1940. The most noticeable growth and extensive use of chemical pesticides such as DDT, aldrin, dieldrin, endrin, parathion, and 2,4-D had been observed during the period of World War II (1939-1945) due to the prior need for the enhancement of food production. Before the 1950s, the application of pesticides seemed to be adventitious to the agriculture field due to the lack of awareness about the hazardous effects of pesticides on the environment and human health and was so minimal. Earlier pesticides were also considered as medicine by the farmers. The introduction of new high-yielding varieties, intensification and commercialization of crop production, continuous crop growing, and improved access to markets brought about major changes in plant protection. Due to the notable

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effects observed by the use of dichloro diphenyl-trichloroethane (DDT) and isomers of hexachlorocyclohexane (HCH), the use of these pesticides has been restricted in various countries of the world. Recently 316 pesticides have been banned in several countries of the world.

Discussion

The major routes for the entry of pesticides inside the human body are inhalation of aerosols, dust, and vapors contaminated with pesticides; contaminated food/water; and direct contact with the human body. Pesticide toxicity to human health depends upon the duration to which the person is exposed to it. Annually, nearly 30,00,000 cases of pesticide poisoning with 2,20,000 deaths have been reported in developing countries. Depending upon the type, way of entry of pesticides, accumulation to the human body and so on it mainly had short-term and long-term effects on human health; acute poisoning and chronic poisoning. Short-term exposure to pesticides that occurs only after a few time of exposure and disappear within a few days is said to be acute poisoning and includes difficulty in breathing, vomiting, diarrhea, loss of appetite, rapid shallow breathing, and so on. Whereas, long-term exposure to pesticides is known as chronic poisoning leading to abnormal functioning of the body's metabolism, and systems (central nervous system, autonomous nervous system, respiratory systems), damage the neurological functions, immune system disruption, over-sensitivity pneumonitis, silo filler's disorder, and neuromuscular respiratory failure. Sex failure due to the sperm mortality, abnormalities in gonad structures, and blood-related disease outcomes were also due to exposure to pesticides. A male working in the green house for more than ten years had the problem related to less sperm count and reproductive failure. Most of the pesticides were lipophilic therefore fat tissues were the major sink for pesticide residues that were ingested or inhaled inside the human body. Pesticides increase the threat of cancer which is becoming the major subject matter to be studied by the researcher all over the world. Reported about 51% of the farmers in the world suffer acute poisoning. One out of ten farmers experienced chronic poisoning among which 24% suffered from chronic neuropathic diseases. It is estimated that 1 to 41 million people would annually suffer from pesticide exposure in the world.

Conclusion

Pests are a broad range of organisms that have a direct negative effect on agricultural production. The pest should be controlled beyond its economic threshold level (ETL). The chemical-formulated substances that are used to control or kill the pests are termed pesticides. The use of pesticides has a benefit to the farmers at a certain level in the short term but it severely affects the health of humans as well as the environment in the long term. Agriculture intensification, lack of awareness among farmers, climate-induced change in pest distribution patterns, pest resurgence, poor regulation, low-quality pesticides, etc. are the major causes of the overuse of pesticides. The persistence of pesticide residue in environments and crops leads to long-term negative health hazards to humans, animals, and ecosystems. The proper management of pesticide use through increasing the efficiency towards the specific pest was a prerequisite for the protection of human, animal, and environmental health adulteration. Pest population monitoring, pesticide alternations, proper time and amount of pesticide application, target-specific pesticide application, biological control, pheromones traps, Integrated Pest Management (IPM), and host plant resistance techniques were the major strategies suitable to reduce the hazardous effects of pesticides. Therefore this review addresses the major issue related to over use of pesticides, their causes, and proper management strategies that would help people protect themselves from serious hazards and overall sustainability of the ecosystem.

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