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AN OVERVIEW OF CHEMICAL PESTICIDES AND ITS IMPACT ON ENVIRONMENT AND HUMAN HEALTH

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Abstract

Chemical pesticides play an important role in agriculture in order to protect crops from the pests such as weeds, insects, rodents, fungi and mould etc. Apart from its advantages, inappropriate use of chemical pesticides leads to the environmental damage and adverse effect on health. This knowledge cannot, in certain cases, be translated into reality by end users including farmers as well as consumers who know the harmful consequences of pesticides. The movement, bioavailability and absorption of pesticides from soil particles are the basis of the atmosphere and water bodies' mobility. There are adverse effects on the soil and the human race with pesticides. It affects people, including prenatal, of all ages. These contaminants damage marine environments when introduced into the water sources. By taking these issues into consideration, this review paper focused on the chemical pesticides and its impact on environment and health. Awareness of appropriate use of chemical pesticides among the farmers will lead to the safer food production that will help in environmental health protection and secure health..

Key words: Agriculture, Chemical Pesticides, Environment, Health, Pesticide

Introduction

Insecticides, fungicides, plant growth regulators, and other chemical and organic mixtures are classified as pesticides. Agriculture and forestry are the main sources of pesticides in the ecosystem. It is common knowledge that the world's rapidly expanding population necessitates increased global food production. To monitor the impact of weed species, a pesticide should ideally be lethal to the target organisms, rather than wreaking havoc on humans and the ecosystem. The overuse of these lethal pesticides has an effect on the entire ecological structure's plants and animals[1]. The extensive use of these hazardous chemical pesticides affects human and other bodies more effectively. The utilization of pesticides in the forest, public health, industry has resulted in tremendous benefits. Pesticides primarily assist farmers in increasing their food production. Other advantages, such as increased crop production, reduced weed damage, vector disease control, and improved food quality, enable pesticides to be used more widely, despite their lethality.

To meet the world's population demands, researchers and manufacturers have developed a number of new and effective pesticides in large quantities. This leads to increased pesticide tolerance, healthier regulations, and a strong desire for food. There is a long list of threats to the environment, most of which are caused by highly diverse pesticides with varying effects. Toxic pesticides are affecting a wide variety of species. Pesticides are used to destroy insects in 80 percent of cases, herbicides in 15 percent of cases, plant fungal diseases in 1.46 percent of cases, and other pesticides in 3 percent of cases. However, herbicides account for about 47.5 percent of global use, insecticides for about 29.5 percent, fungicides for 17.5 percent, and the rest for 5.5 percent. In contrast to global pesticide use of 44 percent, India consumes 76 percent of all pesticides[2].

Many pesticides are related to health and the atmosphere, and some pesticides were phased out. Pesticides can come into the body by skin contact, intake or inhalation. The pesticide type, exposure distance and condition all play a role in the possible outcomes related to. Pesticides in human and body of animal fat can be metabolized, excreted, refined or bioaccumulated. A host of adverse health outcomes, including dermatologic, gastro-intestinal, psychological, carcinogenic, cardiovascular, reproductive and endocrine effects is associated with chemical pesticides. In addition, a high degree of pesticide toxicity at work may lead to hospitalization and

death, either incidentally or deliberately[3]. Different variety related to daily meals and beverages such cooked meals, wine, water, juices of fruits, cooking and animal feed which contain, to mention only a few, pesticide residues. It should also be noted that all traces are not washed and peeled. The concentrations are not generally reached beyond the safe limits laid down by law. However, if two or more chemicals are simultaneously exposed to real-life and can have a synergistic impact; these "fair limitations" may underestimate the real health hazard. In human breast milk tests, pesticide residues were found to raise concerns about maternal toxicity and the effect on children's health[4].

This review article provides an overview of chemical pesticides and its impact on environment and human health. Heavy use of chemical pesticides in the sector of agriculture leads to the environmental damage and human health issues. This article will discuss different types of pesticides and its classes and how chemical pesticides have adverse effect on environment and health. This review paper provides a good reference to the researchers and scholars to understand about the issues associated with the use of chemical pesticides.

Pesticides And Its Types

Insects, Weeds, Algae, Rodents And Microbes are classified as poisons as chemicals used to kill or control them. Various pesticides are shown harmful effect on humans, animal and environmental health. In a number of sectors, such as forestry, food processing and agriculture, pesticides are used. The protection of plants against various pests like weeds, mosquitoes, rodents and fungi and mould, etc., is significant in agriculture. However, the improper application of such agricultural pesticides causes environmental harm and detrimental human health effects[5]. Individuals in diverse fields can be at risk for acute toxicity or occupational diseases. Pest management is based on physical as well as chemical and methods related to biological fields and the methodology employed depending on various factors such as species, condition of environment and pests' distribution etc. Pesticide regulations are based on chemical products called "pesticides" as the most effective techniques. The largest consumers of pesticides are belonging from agriculture sector as well forestry. In a range of industries, trade, stockpiling, and other economic and family businesses, pesticides are often used. The adequate introduction of pesticides produces promising results for environmental safety and increase in the quality, reduction in labor costs and major economic growth.

Plant Protection Product (PPP) is a more specific term than pesticide. Plant protection products are 'pesticides' used to protect crops and plants that are attractive or beneficial. They have a minimum of one active ingredient and are intended for one of the following purposes:

- The main and important purpose is to Protect plants from the different diseases and the pests such as insects before harvesting as well as after harvesting
- It also influence the plant's life by influencing the substances which affect plats growth such as nutrients
- It helps to preserve the products of plants
- Sometime there are various unnecessary plants grow that that has adverse effect on crops, it helps to prevent the growth of plants that are undesired

Generally, the pesticides are categorized and named based on the pest type they control and which pests they are targeting (Table 1).

Table 1: List of Pesticides use in Agriculture in Order to Protect Crop from Pests.

Pesticide	**Detail**

Algicides	Kill algae present in various water resources such as pools, lakes and tanks
Antifoulants	It helps to destroy the organism that are attached to the bottom surface of the water
Antimicrobials	To kill or destroy the different microorganisms such as viruses and bacteria
Attractants	These substances are used to attract or allure different kinds of insects in order to trap or bait.
Biopesticides	These are generated from materials present in the nature such as bacteria; animals and plants.
Biocides	Destroy or damage the microorganisms
Defoliants	These pesticides help in the dropping of foliage or leaves from the plant in order to make harvesting easier.
Desiccants	It enhances the drying process of living tissue associated with unwanted plant tops.
Disinfectants and sanitizers	There are organisms that are produce various diseases related to the plants. This pesticide destroy or damage those microorganisms
Fungicides kill	For killing the Fungi such as mildews, rusts and blights.
Fumigants	These pesticides are highly volatile that means easily converted to the vapor or gas intended to destroy or kill the pests.
Herbicides	In order to destroy the weeds as well as other plants that grows at that place where they are not supposed to grow.
Insect growth regulators	It disrupts or interfere the molting (referred as maturing process from pupal stage to adult stage) as well as also disrupt the other processes related to insect's life.
Insecticides	Are utilized to destroy insects as well as other arthropods.
Miticides (also called acaricides)	Destroy or damage the bug and insects are feed by the plants or it can be by animals.
Microbial pesticides	These type pesticides are utilize to destroy inhibit pests such as insects
Molluscicides	They are used to destroy the snails as well as slugs
Nematicides	These pesticides are especially destroys the nematodes

Ovicides	In order to damage or kill the eggs of mites as well as insects
Pheromones	Hamper the insects behavior in terms of mating
Plant growth regulators	Vary the growth rate of the plants or crops or plant's rate of reproduction
Plant Incorporated Protectants	These substances are genetically produced by the plant and add on to the plants in the favor of plant growth
Repellents	Are fighting off pests such as insects as well as birds.
Rodenticides	For the controlling the rodents including mice

Chemical Pesticides Families

Pesticides can be classified into various groups based on different parameters such as level of toxicity, chemical nature and focus application. The most commonly used method to classification of pesticides focused on its chemical properties (shown in Table 2).

Table 2: List of Chemical Pesticides and Their Chemical Names[6].

S.No.	Chemical Group	Chemical Names
1	Organochlorines	BHC, Isodrin, Heptaclor, Lindane, DDT, Endosufan, DDD, Dicofol, Chlorobenziate and Chloro propylate
2	Organophosphates	Caumphos, Dichlorovas, Diptrex, Demetox, Oxydemeton-methyl, Malathion, Dimefox, Dimethoate, Ronnel, Bidrin and Phorate.
3	Carbamates	***Methyl*****:** Isolan, Aminocarb, Aldicarb, Carbaryl, Carbanolate, and Dimethan. ***Thio*****:** Butylate, cycloate and trillate ***Dithio*****:** Ziram Polyran, Methan, Ferban, Ferban, Amoban, Naban, Zineb, Maneb and Dithane M- 45
4	Pyrethroids	Alphamethrin, Decamethrin, Cypermethrin, Allethrin, Bonthrin and Dimethrin and Tetramethrin
5	Phenyl amides	***Carbanilates:*** Fenuron, Barban, Prophan, Carbetamide, Phenyl Urea, Chlororprofan, Monuron, Diuron,Flumeturon, Chloroxuron, Neburon, Bromuron ***Acylanalide:*** Propanil, Karsil, Alachlor, Solan, Propachlor, and Butachlor ***Toluidines:*** Trifluralin, Nitralin, Benefin, Isopropanil, Oryzalin and Nitralin ***Acetamide:*** Diphenamid
6	Phenoxy alkonates	2,4 5 T(2,4 5 Trichloro Phenoxy acetic acid) Dichloroprop, Sesone, Mecoprop and Erbin

		2,4-D(2,4 Dichloro phenoxy acetic acid)
7	Trazines	Simetryn, Cyprazine, Chlorazine, Ametryn, Propazine, simazine, Atratone and Metribuzin.
8	Benzoic acid	Chloroambin, Neptalan, Dichlorobenil, Tricambas and Bromoxynil
9	Phtalimides	Captan and Folpet and Diflotan
10	Dipyrids	Paraquat and Diaquat

2.1.Organochlorine pesticides:

Organochlorines (OC) are a class of chlorinated chemicals that are commonly used as pesticides. These chemicals are classified as persistent organic pollutants (POPs) because of their long-term environmental persistence. OC insecticides were once widely used to combat malaria as well as typhus, but they are now banned in some of the developed countries. According to figures on the use of various pesticides, the organochlorine class of chemicals accounts for 40% of all pesticides used. Because of their inexpensiveness and requirement to fight many pests, organochlorine insecticides including DDT, Aldrin as well as hexachlorocyclohexane and Dieldrine are belongs to the common pesticides category that are used in Asia's developing countries[7].

2.2.Organophosphorus pesticides:

The phosphoric acid esters are organophosphates (OP). The pesticides in the community OP are effective when the enzyme acteylcholinesterase is irreversibly inaction, which is needed for human, insect and various other kinds of species. OP samples decay rapidly when exposed to sun, air or dirt, but in food and drinking water small amounts have been detected. The most commonly used organophosphate pesticides include glyphosates, which are a more environmentally safe alternative to organochlorines. Organophosphate pesticide Pesticides Malathion, parathion and dimethoate, some of which have been associated with endocrine destruction, form another well-known pesticide in this range[8]. This class of pesticides was related to the malfunction of cholinesterase enzyme, reduced secretion of insulin, disruptions of protein, starch, and fat regular, cells, as well as genotoxic effects and mitochondrial dysfunction, causing neurological and endocrine disorders and cellular oxidative stress.

2.3.Carbamate pesticides:

Carbofuran, ziram and aldicarb-inclusive of carbamate pesticides have been related to endocrine destruction, reproductive abnormalities, and impacts on cellular as well as metabolic system and mitochondrial pathways. Furthermore, in vitro experiments have shown that carbamate pesticides can induce cytotoxicity, genotoxicity, and apoptosis in immune cells belong to human immune system, natural killers' cells and T-lymphocytes in hamster ovarian cell. In addition, carbaryl, the carbamate pesticide, has been confirmed to be a factor of transcription convoluted in the process for dioxin toxicity, as a ligand for the hepatic aryl hydrocarbon receptor[9]. Carbamate pesticides have also been linked to neurobehavioral effects, dementia risk, and non-Hodgkin's lymphoma according to research.

2.4.Other classes of Chemical pesticides:

Another type of chemical pesticides related to reproductive toxicity and endocrine disorder are triazines, such as atrazine as well as simazine, in addition ametryn also. A possible statistical correlation has also been found between the prevalence of triazine herbicides as well as breast cancer. Atrazine, which is a widely utilized as an herbicide connected with oxidative stress and cytotoxicity, is the most well-known triazine. Furthermore, atrazine use in laboratory animals has been linked to reproductive toxicity and sexual maturation delays.

The safest insecticides currently available on the market for agricultural or public health use are synthetic based pyrethroids, including fenvalerate as well as permethrin and sumithrin. However, there is evidence that they can cause endocrine disruption and affect reproductive parameters, including reproductive behavior, in laboratory animals. Moreover, recently a study has linked greater than one pyrethroid metabolite to the DNA damage in the sperm of human which raises issues on the potential harms to human reproductive system. It must also be noted that their risk for developing neurotoxicity is questionable.

Neonicotinoid pesticides, including imidacloprid as well as thiacloprid and guadipyr, have been comparatively recently identified as insecticides at low risk of harming non-target plants. But there is plenty of evidence against it; its effect and impact on bees are a popular example. Study also has the potential to influence the endocrine and reproductive processes of animals. Moreover the expression of the enzyme aromatase which participated in breast cancer and also plays a role in development, can be increased by neonicotinoids, a recent study has showed.

Impact Of Chemical Pesticides On Environment

During preparation and application, the pesticides are primarily released to the environment. Different methods may be used depends on such considerations as the type of formulation, the pest controlled and the implementation time. In cultivation, pesticides can be used on plants or soil. Boom pumps, tunnel pumps, and aerial applications are common for the application of liquid pumps on crops. Pesticides can also be used for a systemic effect. Pesticides may be applied as granules, fumigated or sprayed over the surface of the soil with the possible resulting pesticide penetration into the top of the soil. Pesticides are typically used in seeds before planting. Pesticides may be absorbed, contaminated or passed to groundwater during application; surface water bodies may be penetrated, the atmosphere may be volatilized or ingested by non-target organisms. The physical as well as chemical characteristics of the pesticides and the soil, location conditions and management applies are influenced by pesticide activity and fate[10]. Their solubility decides their transportation into surface rinses and their liquidation into groundwater regarding the physical as well as chemical properties of pesticides. When solubility is higher, transport and lixiviation are higher. The partition factor also influences pesticide behavior, and various chemical products do not leach due to the adsorption of soil particles.

Both the chemical and the soil composition are influenced by adsorption. Pesticides have a volatility tendency to turn into a gas; the greater the volatility, the larger their atmospheric losses. Volatility that can originate from soil, vegetables, water surface and may last days or weeks after application of a pesticide due to environmental conditions such as temperatures and moisture. Over long distances in the atmosphere, chemical products can be transported. As a result of subsequent atmospheric accumulation, surface water pollution can occur. Finally, pesticide degradation decides how pesticides behave and where they end up in the ecosystem. Photodecomposition as well as microorganisms, and a number of chemical and physical reactions may all cause degradation (breakdown into other chemical forms). Persistent pesticides have a low biodegradation rate and may last for a long time in the setting.

Soil characteristics can affect the drive of pesticides as well. Coarse-textured sands and gravels are high-penetration compared to the texture of the soil and water seems to percolate and flow into the earth. As thin-textured soils like clay have a low capacity for runoff, water continues to flow away and result in rivers and lakes. Moreover, the soil has a larger surface for adsorption of pesticide and more clay in its composition. Quite simple to penetrate with highly permeable soils. In this water, pesticides can be diluted and end up in groundwater. Its texture influences the soil's permeability. In soils with high organic matter, pesticides can be adsorbed and dissolved contaminants can be preserved. In comparison, certain soils have a higher population of pesticide degrading microorganisms.

Impact Of Chemical Pesticides On Health

Many staff and residents are in regular contact with pesticides, particularly in rural areas, and fear poisoning. Given that such pesticides cause improvements in the primal, peripheral, and autonomic nervous system structure (e.g. cholinergic crisis, depression and anxiety), this exposure will lead to neuropsychiatric effects

(including mood disorders, depression, and anxiety). Additionally, being relevant agents of neuropsychiatric situations or conditions, these effects can contribute to the use of pesticides as a tool. Pesticide suicide is widely reported by the WHO in several Asian as well as countries belong to Latin American. Pesticides, especially in low- and middle-income countries, are often poorly regulated and widely available. The first pesticide-related suicide epidemiological trials occurred in the early 1990s. Many organizations and policymakers are concerned with pesticide assassinations and suicides because depression and suicide are related directly to high exposure to pesticides[11]. This subject prompted several reports into how and why pollution with pesticides happens and has continually led to the discovery of alternatives to this serious social problem.

Detoxification steps, whether deliberate, unintended or occupational, are critical after poisoning. When the patient has been exposed to a pesticide or if the symptoms are normal, it is easy to identify poisoning. However, poisoning can be impossible to detect if the patient has widespread symptoms. As a result, an examination of the family members and those who were involved during the infection as well as reports on the medical treatment should be performed in conjunction with the procedures to prevent contamination. These individuals are asked if the patient is exposed to the pesticide contaminant and whether they have been poisoned at the same time by other poisons. In addition to these steps related to the recognition, an analytical identification of pesticides are required.

Decontamination techniques must be paired with vital sign monitoring and antidote administration. It's important to remember that new cases of pollution could occur at any time. In addition, doctors and all patients in the same unit as infected persons must wear safety clothing before decontamination and rehabilitation is completed. There are strategies for decontaminating gastrointestinal tract infections. As gastric washing is so intrusive and aggressive, it should only be used in conditions that endanger life. The cathartic mechanism that induces bowel movement forcing pesticide releases is unsuccessful as intoxication causes diarrhea. Adsorbents can be attach to toxic substance and become a stable, viable replacement for it. This substance is not engrossed through gastrointestinal tract, which is defecated by the feces. Even this protocol is used in a cathartic procedure. The utmost popular adsorbent is capable to trigger charcoal but unable to absorbed all pesticides. Finally, the ipeac syrup can help induce vomiting from a medicinal plant. However, this procedure is not recommended for the intake of hydrocarbons or corrosive compounds.

In cases of dermal damage, initiate the process of decontamination by showering the patient with soap and water and cleaning them from the face, hair, nails and ears. If people come into contact with something through your eyes, people must immediately rinse them with large quantity of fresh and clean water. All fabrics and clothing worn by the patient during intoxication should be discarded, including garments and shoes. In the event of widespread exposure, it is important to recognize the need to decontaminate all emergency personnel. Since hundreds of formulations of for existence of pesticides, people will concentrate on the clinical profile as well as pesticides treatment, both as regards the number of cases and their severity, that trigger serious poisoning.

Discussion

The need is clear from the antiquity when organic and chemical pesticides were used. The need to regulate pesticides is apparent. Numerous organic pesticides have since been produced and the biotechnological advances in the use of synthetic chemical substances with pesticide properties and international agrochemical companies, which are dominating a largely global food supply, diverge from traditional agriculture. Current farming practices often depend heavily on the use for human health, ecology, and the climate of chemical pesticides. All issues that need to be tackled in today's agriculture include population evolution, security of food, chemical pesticide risks of health, pesticide reluctance to accept, environmental destruction and climate change. New proposals have arisen in recent years on agriculture and food processing. With a modern context of climate change, climate-smart farming is the ideology. There has been another major controversy, not only in terms of safety, but also in terms of their effect on pesticide use, between proponents and opponents of GM pesticide-resistant plants. It is obvious that a new term for agriculture is required when looking at the health as well as the environmental effects of chemical pesticides. The aim of this new philosophy should be to significantly reduce the use of chemical pesticides and to promote human health, ecology and environment.

Conclusion

Although pesticides aim to prevent, eliminate, or combat dangerous pests, a number of studies have questioned the environmental and human health consequences of pesticides. There are many inherent issues with carrying out large-scale tests to ascertain the origin of the human health conditions associated with pesticide use. There are compelling and unavoidable causal correlations between the susceptibility of pesticides and the occurrence of certain diseases. In addition, some humans are more susceptible than others to pesticide-related infections because they are genetically engineered. Evidence suggests that the most common type of exposure is multi-chemical mixtures, and the toxic impact of that exposure is unidentified, especially for longer periods of time. It is recommended that precision and accuracy in pesticide quantitation, as well as enhanced safety profiles, be developed in order to minimize the risk of negative impact on health of humans as well as the environmen

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