



PESTICIDES: A BOON OR CURSE ON HUMAN AND ENVIRONMENT

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ABSTRACT

Our country is an agrarian economy, it has been a land of organic farming. With the implementation of green revolution in 1960's use of fertilizer and pesticide have increased to increase productivity. Pesticides helps in reducing the crop loss and result in better yield. However, use of pesticides excessively possess serious environmental and human problems. Anyone who uses pesticides or present when sprayed are bound to have risk. Pesticides may travel long distance from the place sprayed and way result in chronic poisoning. The use of pesticides is increasing every year globally and pesticides manufacture, use, storage, and disposal should be strictly regulated to reduce the negative effect on environment and public health. Haphazard use of pesticides and ignorance has increased the risk of exposure not only farmers to pesticide and are becoming a major health threat to all.

Keywords: *Pesticides, exposure, haphazard, health threat.*

INTRODUCTION

The consumption of pesticides for agriculture purpose are increasing. Pesticides are often considered a quick easy and inexpensive solution for controlling weeds and insects, pests in agriculture and other areas. Our country is an agrarian economy, where vast majority of the population is engaged in agriculture and pesticides are applied with the aim of increasing productivity. Pesticide has become indispensable in agriculture production (Gupta, P.K. 2004). About one third of the agriculture products are produced using pesticides (Lin C.J. Men W.J. Lin, Y.J. et, al, 2002). Pesticides have contaminated almost every part of our environment. Pesticides residues are found in soil and air as well in surface and ground water and its contamination possess significant risks to human health as well as environment, insects, plants, fish, birds etc. The crop damage is done by insects followed by pathogens and weeds. Consequently, the use of pesticide in agriculture has been an integral part of crop production in many areas and often very high levels and unscientific pattern of application (Atreya, 2007, Devi, 2010, Shetty et al 2010). The rising cases of brain ailments and other acute chronic diseases in recent years are also due to the adverse effect of pesticides (Abdollahi, Ranjbar, Shadina, Nikfar and Rezaie, 2004).

According to WHO estimates every year 3 million cases of acute pesticides poisoning occur globally (Mittal. K. and Vishwakarma, 2014).

Currently, India is the largest producer of pesticides in Asia and ranks twelfth in the world for the use of pesticides. The problem of pesticide is a serious problem not only in India but globally. The health effects of pesticide use have been a long controversial topic worldwide and have recognized as a serious public health concern during the past decades. In 1962, Rachel Carson mentioned the death of birds caused by indiscriminate spraying of pesticide (DDT) in her book "**Silent Spring**". The farmers are now totally

addicted to these chemicals and their indiscriminately and excessive use in agriculture has led to serious health implications. This book inspired widespread concern about the impacts of pesticides on the human health and environment. DDT was banned in 1972 in U.S.A. and thereafter other countries discontinued use of (Lengoods et, al, 2007, cited in Bernads etal 2015). It is estimated that around 800,000 people in developing countries have died due to pesticides since the onset of the green revolution. Nearly 20,000 people die each year because of pesticide consumption through their food (Bhardwaj and Sharma, 2013).

OBJECTIVE OF THE STUDY

The main objective of the paper is to analyses the repercussions of extensive pesticide use. The paper tries to portray the impact of pesticide use in health, environment, soil, ground water, food, farm workers. The adverse effects of pesticide use are quite evident therefore, it becomes essential to study its side effects and also to review the excessive pesticide used in agriculture activities with a major focus on the harmful effect the pesticide has created.

PESTICIDES DEFINITION

According to Cambridge dictionary pesticide means a chemical substance used to kill harmful insects, small animals, wild plants and other unwanted organisms. Pesticides are chemical compounds that are used to kill pests including insects, rodents, fungi and unwanted plants (weeds). Pesticides are used to kill vector diseases, such as mosquitoes and in agriculture, to kill pests that damage crops (W.H.O). The Food and Agriculture Organization (FAO) defines pesticides as any substance or mixture of substances intended for preventing, destroying or controlling any pests including vectors of human and animal diseases, unwanted species of plant or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs or substances that may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruits. Also used as a substance applied to crop either before or after harvest to protect to commodity from deterioration during storage and transport (FAO 2020).

The term “*Pesticides*” is often used interchangeably with “*Plant Protection Product*”, however, pesticide is a broader term that also cover non plant / crop uses, for example biocides. Within the European Union Legislation, there are separate legislative act for Plant Protection Product (PPP) and occupational exposure to biocides, disinfectants and metal working fluids, biocides (EPA-VS 2012).

CLASSIFICATION OF PESTICIDES BASED ON THEIR PURPOSE

Algicides	Kill algae in lakes, canals, swimming pools, water tanks and other sites.
Antifoulants	Kill or repel organisms that attach to underwater surfaces such as barnacles that cling to boat bottoms.
Antimicrobials	Kill organisms such as bacteria and viruses.
Attractants	Lure pests to a trap or bait, for example, attract an insect or rodent into a trap. (However, food is not considered a pesticide when used as an attractant.)
Biopesticides	Are derived from natural materials such as animals, plants, bacteria and certain minerals.
Biocides	Kill microorganisms.
Defoliants	Cause leaves or foliage to drop from a plant, usually to facilitate harvest.
Desiccants	Promote drying to living tissues, such as unwanted plant tops.
Disinfectants and sanitizers	Kill or inactivate disease-producing microorganisms on inanimate objects.

Fungicides kill	Fungi (including blights, mildews, molds and rusts).
Fumigants	Produce gas or vapor intended to destroy pests, for example in buildings or soil.
Herbicides	Kill weeds and other plants that grow where they are not wanted.
Insect growth regulators	Disrupt the molting, maturing from pupal stage to adult or other life processes of insects.
Insecticides	Kill insects and other arthropods.
Miticides (also called acaricides)	Kill mites that feed on plants and animals.
Microbial pesticides	Are microorganisms that kill, inhibit, or out-compete pests, including insects or other microorganisms' pests.
Molluscicides	Kill snails and slugs.
Nematicides	Kill nematodes (microscopic, worm like organisms that feed on plant roots).
Avicides	Kill eggs of insects and mites.
Pheromones	Disrupt the mating behavior of insects.
Plant growth regulators	Alter the expected growth, flowering or reproduction rate of plants (does not include fertilizers).
Plant Incorporated Protectants	Are substances that plants produce from genetic material that has been added to the plants.
Repellents	Repel pests, including insects (such as mosquitoes) and birds.
Rodenticides	Control mice and other rodents.

Source: EPA (Environmental Protection Agency, 2012)

BENEFICIAL ASPECTS OF PESTICIDES

The roots of agriculture practice can be traced back to 12,000 years ago. The production of pesticides started in India in 1952 at Calcutta. The pattern for use of pesticides is different from that for the world, in India 76% of the pesticides used is insecticides as against 44% globally, (Mathur, 1999). The use of herbicides and fungicides is correspondingly less heavy. The main use of pesticides in India is for cotton, paddy and wheat.

Tremendous benefits have been derived from the use of pesticides in forestry, public health and domestic sphere and agriculture. Food grain production increased as a result of implementing HYV seeds, advanced irrigation facilities and agricultural chemicals. Pesticides have been an integral part of the process by reducing losses from weeds, diseases and insect pests that can workably reduce the amount of harvestable produce (Warren 1998). Considerable economic losses would be suffered without pesticide use and quantified the significant increases in yield and economic margin that result from pesticide use. Besides, most of the pesticides in environment undergo Photochemical transformation to produce Metabolites which are relatively non-toxic to the human beings as well as environment (Kole. R.K. Banerjee Chowdhury, 1999).

Protects crop losses and yield reduction, herbicides provide an economic and labor benefit, effective, effective weed control practice prevent reduction in rice yield

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due to weeds.

Control of vector borne disease like malaria and reduce mortality and morbidity and make better place to live.

Sectors like transport, sport, building, roads etc. use pesticides extensively particularly herbicides to maintain them.

DARK AND HARMFUL ASPECTS OF PESTICIDES

Pesticides are designed to kill pests but some pesticides can also cause negative health effects in people and damage ecosystem. Wide use of pesticides can cause both acute and chronic adverse health effects in human.

EFFECTS ON HUMAN

Extensive use of pesticides does pose a potential risk to humans and environment. Use of pesticides can cause Asthma, birth defects, neurological effects, Cancer, hormone disruption, Endometriosis, Hypospadias, undescended testicle precocious puberty in girls, reduce sperm counts etc. Study have revealed that the association organochlorine and organophosphate with diabetes mellitus. Organophosphate inhibits the neurotransmitter acetyl cholinesterase and can affect the central and autonomic nervous system. Few leading symptoms related to the autonomic system are abdominal cramps, nausea, diarrhea, salivation miosis and symptoms relating to central nervous system are dizziness, tremor, anxiety and confusion symptoms usually occur within hours of exposure and typically disappear within days or weeks as new cholinesterase is synthesized (Aryal et, al, 2016).

EFFECTS ON SOIL

The intensified use of pesticide in a common practice in agriculture these days and it has not only polluted the soil but has also affected its fertility. This pollution is not only a threat to micro-organisms residing in soil but also to the ecosystem. Uses of pesticides and fertilizers are also one of the factors of deficiency in micronutrients content of the soil. According to the soil scientist Dr. Elain Lugham soils have not received the respect nor the attention they deserve. Mechanical and biological processes have not been as well understood as they need to be because the green revolution has masked the severity of the crisis (Mac Cabs, C.L. and Bartrm, 2015). The effects of pesticide on soil micro-organisms can cause a ripple effect that can last for years. Overuse of chemical fertilizers and pesticides have effects on soil organisms that are similar to human overuse of antibiotics.

EFFECTS ON GROUND WATER

Pesticides including herbicides can and leach into the ground to contaminate the groundwater. In our country groundwater is mostly used for drinking and irrigation purposes. The groundwater has been contaminated by nitrates. Pesticides are one of the major sources of this nitrate contaminations. According to the Central Pollution Control

Board on the quality of the groundwater that the ground water is contaminated by pesticides. Contamination rate among the states may differ and it may not look like a problem but slowly mounting to be one (Sen Gupta, Trivedi, Agarwal and Gupta, 2008).

We have used heavy amount of pesticides on our farms and there is a chance to leach deeper into the earth and pollute the ground water. The ground water is not only polluted by nitrates but chlorides, arsenic and lead mainly due to industrial discharge and other activities. Groundwater contamination is also a major problem nowadays. Once the groundwater is polluted with toxic chemicals, it may take years for the ccontamination to dissipate or to be cleaned up. Clean up many also be very costly and complex, if not impossible (EPA, US, 2001).

EFFECTS ON FOOD

Many food products will have a number of pesticide residues. When the crops or cereals are treated with chemicals there are chances to have residues in the product and enter our food chain. Although many pesticides act at the same site no calculation are made to determine multiple residual exposure in diets. Many food products will have a number of pesticide residues. There is an increasing trend in residue in food products. The Food Safety and Security Authority of India has to set up an appropriate rules and regulations to prevent our food chain from the contamination foods.

EFFECTS ON FARMERS

Farmers or workers are the people who are mostly exposed to pesticides. The government has neglected the monitoring of pesticide use in farms in the past and time has arrived to take concrete action or it would be too late. A significant case of farm workers getting ill due to pesticide has been reported in Malwa, Punjab (Milthal, K. Vishwakarma, 2011). High number of Cancer cases have been noticed in this area and this place is known as Cancer Capital of Punjab. According to Department of Health and Family Welfare, Cancer prevalence in this region is much higher than the National level. The Cancer cases in other states like Andhra Pradesh and Kerala have also increased due to pesticides (Rao, 2016).

EFFECTS ON WILDLIFE

Pesticides are applied in many forms in a various delivery method to forests, rangeland aquatic habitats, farmlands, rights of way, urban turf and gardens. Their widespread use makes contact with pesticides residue inevitable for some wildlife. Pesticides poisoning to wildlife may result from acute and chronic exposure and also pesticides may impact wildlife via secondary exposure or through indirect effects to the animals or its inhabitants.

Acute poisoning refers to short exposure to some pesticides may kill or sicken wildlife. Examples of acute wildlife poisoning include fish kills that are caused by pesticides carried on ponds, streams or rivers by surface runoff or spray drift and bird die-off caused by foraging on pesticide treated vegetation or insects or by consumption

of pesticide treated granules, baits or seeds. In general, acute poisoning to wildlife takes place over a relatively short time, impacts a very localized geographical area and linked to a single pesticide.

Chronic poisoning can be termed as exposure of wildlife over an extended period of time to pesticide levels not immediately lethal may result in chronic poisoning. The most well-known example of a chronic effect in wildlife is that of the organochlorine DDT on reproduction in certain birds of prey. DDT and other organochlorine pesticides such as dieldrin, endrin and chlordane have been implicated in bird mortality, resulting from chronic exposure. Organochlorine pesticides used in some foreign countries may pose risk to migratory birds which overwinter there.

Secondary poisoning may impact wildlife through secondary poisoning when an animal consumes prey species that contain pesticide residues. Example of secondary poisoning are birds prey becoming sick after feeding on an animal that in dead or dying from acute exposure to a pesticide and the accumulation and movement of persistent chemicals in wildlife chain.

Indirect effects refer to pesticide effecting wildlife in ways other than direct or secondary poisoning. Pesticide may impact wildlife indirectly when a part of its habitat or food supply is modified. For instance, herbicide may reduce food, cover and vesting sites needed by insect, bird and mammal populations, insecticides may diminish insect populations fed on birds, a fish species, insect pollinators may be reduced, thereby affecting plant pollination.

RECOMMENDATIONS AND SOLUTIONS

Pesticides have contaminated our ecosystem therefore there is need to come up with an alternative solution, some are traditional and others are modern. There has been a paradigm shift through slow from modern-chemical-farming towards sustainable farming which depends on local farm resources across the globe. The neem-based solutions like oil (neem-based pesticides) have been sprayed on the crops like tea to control diseases like red dust and blister blight.

“Green Gold” is a bio-pesticide is also another option to chemical pesticides. Bio-pesticides are typically microbial biological pest control agents that are applied in a manner similar to chemical pesticides. Most beneficial advantages of bio-pesticides are that they are the harmful residues are not detected. They can be cheaper than chemical pesticides when locally produced. They can be more effective then chemical pesticides in the long run.

The use of organic pesticides can keep the healthy balance in the soil. Many organic pesticides are made from minerals or other plant materials that keep pests a bay and break down quickly in the soil. Examples of some organic pesticides include-

Cayenne pepper spray, which can be sprayed on the leaves of the plants to deter harmful insects. *Soap spray*, also sprayed on plants to get rid of aphids. *Tobacco powder*, spray can be made from the finely ground tobacco leaves and water which is used to kill sucking insects on plants such as aphids, thrips and spider mites. *Pyrethrin*, made from chrysanthemum plant. This organic pesticide is used to knock out the flying insects and ground pests such as grubs. *Sabadilla*, derived from sabadilla lily is used to control caterpillars, leaf hoppers, stink bugs and squash bugs.

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Crop rotation is another measure to control pests alternating different crops one after another throughout the year can help in warding off the pests. It helps in preventing the pests to get used to one type of crop it cultivated rotationally. It not only protects the plant from pests but also helps in enhancing the soil fertility, if different crops are grown in different seasons. Planting legumes, a plant that help in enhancing the level of a micro-nutrients (Nitrogen) through nitrogen fixing bacteria that resides in the roots and after these planting crops that require a high degree of nitrogen will help in making soil healthy every growing season. And healthy soil helps in fighting with the pests (Mohler and Johnson, 2009).

Intercropping is a unique technique to simultaneously cultivate two or more crops on the same field. It works on the way that pests are attracted away from the host crops. It is on the “Push-Pull”, model Kenyan farmers have designed this method and cultivate the plants that repel pests, pulling them away from the host crop. The farmers grow maize with two types of cereals one that helps push pests away from the maize and another that pulls away pests away from the maize. This method has helped to reduce the impact of the devastating maize stem borer and increase crop yield (Khan Amudavi and Pickett, 2008).

Crop diversity, if large varieties of crops are grown on the farm then these plantations are less susceptible to the pests. It is seen that pests attack more or less on monoculture type of farms when lots of food is available. It also enhances the yield, keep the nutritional diversity and health. It is an environmentally sound method to control the pests which also helps in checking the soil fertility.

Using pests against pest method to kill the pest. Predator pests are grown in farm to kill or keep away the pests which are the possible threat to the crops.

Organic pesticides which is healthier for people and the environment and also eco-friendly. Neem leaves, Timur, garlic, livestock urine are some example of organic pesticides.

Time dilation method is also another good method of controlling pests. The practice of early planting of crops so that as the time comes for the pests to attack the crops, most of the crops have outgrown the stage of the attack.

Light traps method, although a traditional method used in India, these indigenous method needs to revive. In this method light pests get attracted to light at night and then fall into their watery grave below which is a pail of water mixed with kerosene.

SOME GENERAL MEASURES TO CURTAIL EXPOSURE TO PESTICIDES

- Proper information and Training to the farmers.
- Health Surveillance and monitoring the various changes due to pesticide exposure.
- Job rotation.
- Use of personnel protective measures like head covering eye, gloves, footwear, clothe etc.
- Integrated Pest Management (IPM) approach to minimize use of pesticides.
- Regulating strict law and regulation on pesticides with preventive health programs.
- Proper storage and transportation etc.

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CONCLUSION

Pesticides have contaminated almost every part of our environment. Pesticide residues are found everywhere. Many people have died due to pesticides since the onset of the green revolution. People need

to break the habit of using harmful pesticides and switch to organic ones that break down easily in the sunlight and in the soil and safe. Need of the hour is to boost the Integrated Pest Management (IPM) programs which can reduce the use of chemical pesticides. Proper protective gear, training programs, benefit of using bio-pesticide should be widespread, pesticide management and education improvement in monitoring and regulatory mechanism, adoption of scientific techniques should be encouraged, and reduce pesticide contamination in our environment is for all of us to do. We should remember the food which we are consuming today has been adulterated with pesticides. We are blindly ingesting these cocktails of poisonous chemicals. Hence, let us not pass on this pesticide poisoning to our next generation.

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