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Effects of Chemical Fertilizers and Pesticides in Agricultural Environment

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Abstract – Marketable agricultural surplus is the most significant element that affects a country's economic development in emerging countries like India. As the population grew, so did the need for agricultural commodities, and thus the Green Revolution was born. Developmental countries like India benefited from the Green Revolution, which used high-yielding seed types, modified farming equipment, and significantly increased chemical fertilizer use to produce more food and other agricultural goods. There is no way around the use of chemical fertilizers and pesticides if we are to feed the expanding population without them. The use of such agricultural technologies has allowed food grains to grow and remain viable, but they have had significant negative consequences for both the environment and human health. The impacts of chemical fertilizers and pesticides on human health and the environment are sketched out in this article. Agriculture and metal businesses, together with poor waste management, fertilizers, and pesticides, are polluting our rivers and soils. Pesticides and heavy metals have also been implicated in a wide spectrum of human ailments. In recent years, pesticide-related concerns have been widely have drawn a lot of attention from concerned groups in India.

Keywords – Chemical Fertilizers, Pesticides, Agricultural and Environment etc.

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INTRODUCTION

Land is the most fundamental building block for human existence and growth. Agricultural production cannot be carried out without cultivated land. In order to ensure the long-term viability of our food supply, we must have a specific quantity of cultivated land. Agricultural ecological problems, particularly heavy metal contamination of farmland, have increased as a result of non-direct consumption of agricultural products due to increased non-agricultural land and labor force cultivation and modernization in recent years against a historical backdrop of urbanization, industrialization and agricultural modernization [1].

All sorts of wastes, including solid waste, waste gas, and wastewater, which contain fertilizers and pesticides that are difficult to breakdown, are released in the course of human everyday life and industrial production. Pesticides and fertilizers find their way into the food chain, where they end up in creatures, posing a threat to not just human health but the health of the entire ecosystem. Human activities such as mining for minerals, chemical smelting, rubbish treatment, urban wastewater, vehicle exhaust emissions, pesticide and chemical fertilizer application, and more are important sources of heavy metal contamination in agricultural land. In agricultural settings, the most common method of exposure to fertilizers and pesticides is through the use of an integrated soil–crop system [2].

ENVIRONMENTAL POLLUTION

As a result of disturbances to our natural environment that hurt all living things—plants, animals, and humans—pollution occurs. A substance that contributes to pollution is referred to as a "pollutant." Pollutants, which can take the shape of solid, liquid, or gaseous compounds, are created by both humans and nature. The average person requires around 12-15 times as much air as they consume in relation to the quantity of food they eat. Consequently, even the tiniest quantities of airborne pollutants can have a significant impact when compared to those found in food. The natural processes that occur in nature may swiftly break down biodegradable contaminants, such as discarded vegetables. When it comes to pollution, the slower it degrades, the more time it has to linger in the environment. It is exceedingly difficult to get rid of DDT, plastics, heavy metals, a variety of chemicals, nuclear wastes, etc., after they've been released into the environment. Nature is unable to break down these toxins, making them hazardous to all living creatures. In the process of

environmental contamination, pollutants originate at a source, migrate via the air or water, or are dumped on the ground by humans [3].

Effect of Pesticides in Environment

Pesticides are used in agricultural, residential, and industrial settings to control pests. Herbicides, insecticides, fungicides, and rodenticides are some of the several types of pesticides. Among the many different types of pesticides, the most dangerous and long-lasting are the organ chlorine pesticides (OCP), organophosphate pesticides (OPP), and carbonate pesticides (CCP). Most pesticides are broad-spectrum and can kill both the target and non-target species at the same time. OCPs insecticide has been outlawed in the majority of industrialized nations [3-4], although it is still used in several underdeveloped nations. Careless pesticide use will harm the environment because of the health injury caused by the direct or indirect application of pesticides, contamination of ground and surface water due to agricultural runoff and discharge, the movement of pesticide residues through the food chain to the consumers, an increase in the conflict of pest populations to pesticides, in that way decreasing their worth and as a result pest outbreaks, the decrease of useful insects like parasites. As a result of pesticide use, the number of microorganisms decreases as well [4].

Application and Impacts of Pesticides on Soil

The word "solum" comes from the Latin word for dirt. The term "soil" is often used to refer to the thin, irregular coating of mineral and organic material that covers the earth's surface. Minerals, organic matter and liquids are found in soil in order to support plant life. The physicochemical characteristics of soil are affected by the presence of pollutants or contaminants that are submerged. Agricultural and industrial activities are the primary causes of soil contamination. The most common concern with environmental contamination is polluted soil. Toxic substances, chemicals, salts, radioactive elements, and disease-causing agents may all be found in soil, which has a negative impact on plant development and animal health.

Water can be contaminated by soil pollutants: It is the flow of water from the soil surface into the soil profile, which is a precious resource that supports human and plant life. Due to the presence of soil contaminants, there is a decline in the soil's ability to produce. In addition, soil contaminants have a negative impact on the soil's physical, chemical, and biological qualities, reducing its productivity. In addition to industrial activity, agricultural activities such as pesticides or fertilizers that contain chemicals that are not fully degradable in nature and are widely used around the world; waste disposal, where there is a large amount of industrial and municipal waste that is dumped directly into landfills without any treatment; and accidental oil spills are all factors that contribute to soil pollution [5].

Impacts of Pesticides on Water Resources

In the Earth system, water is the most plentiful and precious chemical and all living organisms require water for their survival. Ocean water covers 97 percent of the Earth's surface, making it unfit for drinking and other purposes due to its high salt content. As for the remaining 3 percent: 2 percent is found in glaciers and icecaps in the Polar Regions, while just 1 percent may be found as freshwater in rivers and lakes. We cannot overstate the importance of groundwater for the survival of civilization. Our groundwater quality is rapidly deteriorating due to contemporary civilization, industry, urbanization, and population growth [6].

Fresh water makes up around 20% of the world's groundwater supply, which is widely used for a variety of reasons. Less than one percent of the world's fresh water is supplied by rivers, ponds, lakes, and other similar bodies of water. The investigation of the physical and chemical features of groundwater is essential for the research of public health. This research is an essential component of environmental contamination investigations. Human survival, ecological stability, and the incredible future of our planet depend on it. According to the national water policy, water is an inadequate natural resource that is necessary for human survival, livelihood, food security, and long-term growth. Each and every living creature has a fundamental right to safe water intake. In order for creatures to thrive and for input systems, organizations and economies to run smoothly clean, safe, and adequate fresh water is required. Water-based eco-systems provide a wide range of services essential to human well-being, and one of the most important of these is the reduction of water shortages and the provision of fresh water.

Effect of Pesticides on Water Quality

Because of unique natural conditions, ecosystems, and intended human uses, the water quality criteria varies greatly.. Sediment is an indication of the quality of the water that lies underneath it, and its study is useful in assessing environmental contamination. For irrigation and industrial applications, contaminated chemicals and large populations of certain microbes might constitute a health risk because of their potential to contaminate soil and water with harmful compounds. Animals use the water for drinking and habitat because of these qualities. It is possible to describe the water's quality using its physicochemical and microbiological properties [7]. Because of the widespread use of pesticides and fertilizers, agriculture is a major non-point source of water pollution.

In order to incentivize producers to alter their production methods in ways that enhance the environmental and economic repercussions of innovation, reduction strategies might be explored. Testing water before it is utilized for a variety of purposes, such as drinking, residential, agricultural, or industrial, is an absolute need. Various physico-chemical criteria are used to evaluate water quality. As part of the physical and chemical examination of an environment's physical characteristics such as temperature (temperature), colour (odour), pH (pH), turbidity (turbidity), TDS (electrical conductivity), electrical conductivity (electrical conductivity), etc. When assessing the quality and purity of water, organic and inorganic contaminants such as pesticide residue should be taken into account [7-8].

Effect of Pesticides on Vegetables

Vegetables are a necessary part of a balanced diet that should be consumed on a regular basis by everyone. It is rich in minerals and nutrients that aid in the prevention of illness. An effective pest management system is strongly linked to the use of chemical pesticides and is a vital instrument for boosting agricultural yields by preventing insect and disease attacks on the crops in the region. As the world's population grows, tropical nations will be forced to increase agricultural production in order to meet the rising demand for exotic and out-of-season vegetables and cereals. This increased demand for crops is met by emerging nations like India, which are located in the tropics, thanks to globalization.

Intensive pest control and fertilizer use are unavoidable, even when using organic methods, in order to supply the year-round demand for crops in huge numbers. Wrong pesticide application methods, ignorance about pesticide repercussions, and poor spraying equipment maintenance exacerbate these dangers. Pesticide toxicity thresholds and regulator-acceptable limits have frequently been the subject of debate in scientific and governmental circles [8].

Effects of Chemical Fertilizers and Pesticides on Human Health

Spraying pesticides without safety masks, gloves, and other protection can lead to eye and skin irritation, as well as respiratory system disorders such as asthma, if the farmers are not properly protected. Farmers in Bhopal, Madhya Pradesh in India were found to have a link between the amount of pesticide they used and the symptoms of illnesses induced by pesticide exposure. People who had been exposed to irritant sprays for 18 months experienced acute symptoms such as burning/stinging of the eyes and nose as well as a decrease in vision and increased sweating and shortness of breath (28.9 percent) [9].

By consuming infected food, inhaling dirty air, or drinking contaminated water, a person might be exposed to fertilizers and pesticides. Bioaccumulation occurs when fertilizers and pesticides are consumed or inhaled into the body. Their classification as "hazardous" is due to this.

ORGANOCHLORINE AND ORGANOPHOSPHATE PESTICIDES

1. **DDT (Dichlorodiphenyltrichloroethane):** To keep mosquitoes at bay, DDT, a chemical pesticide, is frequently used to treated water. It persists in the environment and builds up in the food chain as a result of its presence. As an endocrine disruptor and carcinogen, the use of DDT has a detrimental effect on human health. DDT has been prohibited in most industrialised nations, including the United States [10].

2. **Aldrin:** Aldrin is a water-insoluble organocholrine pesticide. Nut, beetle, and cotton pests are the primary targets of Aldrin pesticide. Because of its toxicity, most governments have outlawed it. The carcinogenicity of aldrin has been established.

3. **Dieldrin:** Termites can be controlled with the use of Diledrin. It is a chemical contamination that is extremely difficult to remove from the food chain. As a result, long-term exposure to this toxin has far-reaching health consequences for animals, including humans. As a result, it is illegal in the United States. Dieldrin is implicated in a variety of health issues, including Parkinson's disease, breast cancer, and damage to the reproductive and immunological systems. There is a direct impact on the body's endocrine system as well. If a pregnant woman is exposed to it, it can have a negative impact on the fetus's testicular function [11].

4. **Lindane:** Lindane, a pesticide extensively used in the cotton industry, affects the neurological system and can induce everything from headaches and dizziness to seizures and, in rare cases, death. Agricultural use of lindane was outlawed in 2009 by the Convention.

5. **Heptachlor:** Organochlorinated pesticide Heptachlor is used to manage soil pests and can remain in the soils for decades. The neurological and immunological systems of both humans and animals are affected by Heptachlor.

6. **Endrin:** An Organochlorinated pesticide, Endrin is used. It is effective against the zoocide of black current mud mites.

Environmental endrin has a long half-life and can cause dizziness and headaches as well as confusion and agitation. It can also cause nausea, vomiting and convulsions in animals.

7. **Endosulphan:** Endosulphan is a controversial agricultural chemical because of its acute toxicity and bioaccumulation potential, which disrupts the endocrine system's function. Endosulphan usage and production were outlawed under the 2011 Stockholm Convention. Pests such as whiteflies, Colorado potato beetles, and cabbage worms can be controlled with its aid. Endosulphan has a negative impact on both the reproductive and endocrine systems of animals, resulting in developmental defects.

8. **Methoxychlor:** Parasites, mosquitoes, cockroaches, and other insects can be treated with Methoxychlor. Toxic to mammals, it accumulates via the food chain. It's a known endocrine disruptor, so stay away from it. These pesticides have been outlawed in the United States and the European Union.

9. **Organophosphates:** Phosphate insecticides, such as organophosphates, are commonly used to combat various fruit and vegetable pests. Acetyl cholinesterase (AChE) is inhibited in nerve cells by this substance, which is very poisonous and has negative effects on the nervous system.

10. **Parathion:** A larvicide for the control of mosquitoes, parathion is an organophosphate insecticide and acaricide. It causes severe diarrhoea, unconsciousness, tremors, dyspnea and lung-edema diseases as a result of parathion's disturbance of the system by blocking the acetyl cholinesterase [12].

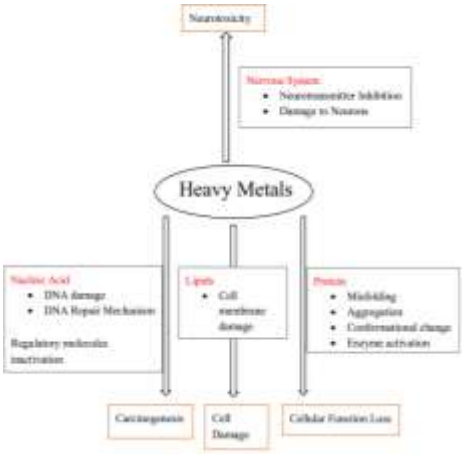

Figure 1: Heavy metal source pathway and human exposure

Fertilizers and pesticides applied to fields end up in crops like maize and vegetables, where they can harm human health in a variety of ways. Furthermore, pesticides are sprayed to vegetables that are directly ingested by humans and cattle. Overuse of fertilizers can lead to nitrate contamination of groundwater, which is dangerous to both people and cattle. Some of the hemoglobin in blood can be immobilized by nitrate-concentrated water [13]. There has been an upsurge in the usage of organophosphate pesticides due to the fact that they are less persistent and environmentally hazardous than organochlorin pesticides. However, they are linked to a variety of acute health issues, including nausea, vomiting, dizziness, migraines, and skin and eye disorders. Cancer and pesticides has been the subject of several researches. Vegetable pesticides, such as organophosphate insecticides, are linked to cancer because they accumulate in our bodies over time.

Hazardous agricultural practices such as the excessive and indiscriminate use of toxic agrochemicals have been found to have an adverse effect on human health in India and the environment. There is a specific concern about the contamination of soil and water with harmful agrochemicals (such phosphate fertilizer that is loaded with heavy metals, pesticides and herbicides, for example). Small amounts of contaminants in water can't be seen or tasted, making them difficult to detect. Chronic kidney disease is a dangerous illness that doesn't develop in people for several years after exposure to these toxins [14].

CONCLUSION

Most of the world's population relies on agriculture for food supply, hence pesticides are frequently employed in agricultural fields to protect harvests from danger and boost productivity. Adequate measures must be made to protect human life and the environment from pesticides' hazardous effects. By now, it should be common knowledge that we must do everything we can to care for our mother Earth by switching to an organic agricultural system. Biodynamic agriculture is less harmful to the environment and more conducive to good health for humans as a whole. Untreated waste water from the industrial and household sectors, inappropriate use of pesticide and synthetic fertilizer, atmospheric deposition of suspended particulate matter generated by vehicles, etc. might be the source of contamination of such fertilizers and pesticides in the environment. These insecticides and fertilizers can cause serious health issues in humans. For this reason, frequent monitoring of such fertilizers and pesticides is essential in order to tackle the associated difficulties.

REFERENCES

1. Halimatunsadiah, A. B., Norida, M., Omar, D. and Kamarulzaman, N. H, (2016), Application of pesticide in pest management: The case of lowland vegetable growers, International Food Research Journal, 23(1), pp. 85-94.

2. Edori, O.S., and Iyama, W.A.,(2017) Assessment of Physicochemical Parameters of Soils from Selected Abattoirs in Port Harcourt, Rivers State, Nigeria, Journal of Environmental Analytical Chemistry, 4(3), pp.1-5.

3. Sharma, D. R., Thapa, T. R., Manandhar, H. K., Shrestha, S. M., and Pradhan, S. B., (2012), Use of pesticides in Nepal and impacts on human health and environment, J. Agric. Environ, (13), pp. 67-72.

4. Borkar, A.D., (2015), Studies on Some Physicochemical Parameters of Soil Samples in Katol Taluka District Nagpur (MS), India Research Journal of Agriculture and Forestry Sciences,3(1), pp. 16-18.

5. Ezio Ranieri., Fabian Bombardelli., Petros Gikas., and Bernardino Chiaia., (2016) Soil Pollution Prevention and Remediation, Hindawi Publishing Corporation Applied and Environmental Soil Science, pp. 1-2.

6. Sunita R. Dandwate., (2012), groundwater quality of kopargaon area, maharastra state, india during pre-monsoon and post-monsoon seasons, E-Journal of Chemistry, 9(1), pp. 15-20

7. Mary Helen, P. A., Jayasree, S., Antony Johnson, J., Belsha Jaya Edith, I. H., Chittarasu (2011), Seasonal Variations In Physico Chemical Parameters Of Water In Coconut Husk Retting Area, Parakkani, Tamil Nadu International Journal of Environmental Sciences, 1(6) pp. 1063-1068.

8. Defargea, N., Spiroux de Vendômoisb, J and Séralinia.,(2018),Toxicity of formulants and heavy metals in glyphosate-based herbicides and other pesticides, Toxicology Reports, Elsevier, 5, pp. 156-163.

9. Rupali B. Patil, Saler, R. S. (2013), studies on contamination level of pesticides Residues on grape growing soils in Nashik district, International Journal of Advanced Technology in Civil Engineering,2(1),pp. 24-26.

10. Alagappan Sethuraman, Solomon Kiros, Zewdneh Tomass, (2013), Residues of Organochlorine pesticides in fishes from the Mumbai West Coast of India, Int. J. Pure Appl. Zool., 1(1), pp. 109-116.

11. Sachin Kumar, Anil K. Sharma, S.S. Rawat, D.K. Jain And S. Ghosh Use of pesticides in agriculture and livestock animals and its impact on environment of India , Asian J. Environ. Sci., 8(1) June, 2013, pp. 51-57.

12. China Chunling Luo., Chuanping Liuc., Yan Wang., Xiang Liu., Fangbai Li., Gan Zhang., Xiangdong Li . (2011), Heavy metal contamination in soils and vegetables near an e-waste processing site, south China, journal of hazardous materials, 186(1), pp. 480-491.

13. Singh Leena, Choudhary, S.K., Singh, P.K. (2012), Organochlorine and Organophosphorus pesticides residues in Water of River Gangaat Bhagalpur, Bihar, India

14. Jinky Leilanie Lu, (2010), Analysis of trends of the types of pesticide used residues and related factors among farmers in the largest vegetable producing area in the philippines, 5(2), pp. 184-9.

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