

## AGROCHEMICALS' IMPACT ON THE HEALTH OF THE ENVIRONMENT

SHEETANSHU GUPTA<sup>1</sup>, ALTAF KUNTOJI<sup>2</sup> AND SHAKULI KASHYAP<sup>3</sup>

<sup>1</sup>BSSCOP Mohanlalganj, Lucknow, U.P., India

<sup>2</sup>Department of Soil Science and Agricultural Chemistry, UAS, Raichur, Karnataka

<sup>3</sup>College of Agriculture Sciences, TMU, Moradabad 244 001, U.P., India

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### ABSTRACT

Agrochemicals used continuously to control weeds and insect pests have a major negative impact on the environment and human health. There is an inadequate amount of training, education, awareness, and information available to farmers in developing nations on the use of chemicals. Farmers utilize harmful pesticides in their fields in an improper manner and quantity, which results in a wide range of human ailments. The length of time that people are exposed to agrochemicals, the type of agrochemicals used, and many environmental factors all have an impact on how well they are able to maintain their health. There are large concentrations of these substances in the earth, the air, the water, and human bodies. To minimize these hazardous effects many countries are bending towards organic farming and sustainable agriculture.

**KEY WORDS :** Agrochemicals, Human health, Environmental impact, Organic farming.

### INTRODUCTION

The phrase "agrichemical" refers to a variety of chemical compounds that increase crop output, including fertilizers, pesticides, synthetic hormones, insect repellents, antimicrobials, disinfectants, and plant growth regulators. The chemical load on natural ecosystems, particularly terrestrial ecosystems, has risen as a result of industrialization. Agrochemicals are substances that farmers employ on their farms to protect and boost the yield of their crops. In addition to that, pesticides are used in public health initiatives and urban green spaces to protect both plants and people from a variety of diseases. For instance, pesticides can be used to prevent malaria as well as other vector-borne illnesses like dengue and many others. In nature, pesticides may be found almost anywhere. It is equally beneficial and detrimental to people and other living things. Their side effects, however, can be a significant risk factor for environmental health because of their numerous unfavorable health and

environmental effects. Humans have used insecticides to safeguard their crops before 2000 BC. The earliest known pesticide was elemental sulfur dust, which was utilized in Sumer in prehistoric Mesopotamia around 4500 years ago. First, farmers began using DDT as insecticide in 1940. Consumption increased significantly over time; for instance, from 1960 to 1980, pesticide use in the USA doubled. Agriculture is where the bulk of pesticides are utilized, but in 1999, 74% of American households were said to be using at least one pesticide inside. Use has increased in emerging nations, with the markets in Africa, Australia, Asia, and America, and the eastern Mediterranean experiencing the highest growth. Crops raised for export require a lot of pesticides (Dr. N. Besbelli, personal communication). Even though they only consume 25% of the insecticides generated globally, poorer nations account for 99% of all deaths. This is due to the fact that underdeveloped nations often have weaker regulatory, health, and educational systems, and hence pesticide usage is more frequent

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(<sup>1</sup>Associate Prof., <sup>2</sup>Research Associate, <sup>3</sup>Assistant Prof.)

and dangerous. When pesticides are employed, exposure can occur by ingestion, inhalation, or skin contact. The types of pesticide, the duration of exposure, and the method of exposure, all affect the potential health consequence (Zabed *et al.*, 2021). Animal or human bodies may metabolize, expel, store, or bio-accumulate pesticides in body fat. The multiple unfavorable health impacts of chemical pesticides also include effects on the skin, gastrointestinal system, nervous system, lungs, reproductive system, and endocrine system. Furthermore, high levels of accidental, deliberate, or occupational pesticide exposure can lead to hospitalization and even death. Numerous commonplace foods and drinks, including cooked meals, water, wine, fruit juices, and animal feeds, can contain pesticide residues. It should be noted that chemical residues cannot be totally removed by washing and peeling. Human breast milk tests have also shown traces of pesticides, mostly endosulfan, and there are worries about the exposure of unborn infants and potential health repercussions. In Bangladesh, pesticides as agricultural inputs were first used in 1957, mostly DDT and BHC (Islam, 2000). As compared to other developing nations, Bangladesh uses fewer pesticides (0.03 kg/ha vs 0.3 kg/ha in India, 0.4 kg/ha in Sri Lanka, and 0.8 kg/ha in Indonesia) (Sultana and Nobukazu, 2001). However, pesticide use is currently steadily rising. This analysis was conducted to learn more about the negative effects of agrochemicals, including pesticides, herbicides, and other agrochemical usage practice. In addition, the knowledge, attitudes, and views of Bangladeshi farmers regarding the effects of pesticides on human health and the environment were assessed in this review. organophosphorus, urea, phenoxy alkanolic, triazine, chloroacetanilide, or glyphosate-based *pesticides* are a few of the several chemical pesticide classes. The common herbicide "glyphosate," an organophosphate pesticide, is given more attention. Endosulfan was widely used to enhance cashewnut by the Kerala Govt. for 25 years in Kasarkore village of Kerala, about thousands of tons of endosulfan were sprayed on 15000-acre lands. Now the ill effect is seen in Kerala. The Central Govt. of India announced 500 crores of relief funds to victims and banned the use of endosulfan on the notice of the Supreme Court. It shows that we need to reduce the application of chemicals in our food system and adopt an alternate new highly modified agriculture technique that can feed a huge human population and maintain our

ecosystems. The goal of the current assessment is to draw attention to the pressing need for a new agricultural idea incorporating a significant decrease in the usage of chemical pesticides.

### Exposure of agrichemicals

The population of developing countries like Bangladesh, Sri Lanka, and India is not completely protected against exposure to agrochemicals and serious health effects. Agrochemicals harm natural biodiversity (Brancalion *et al.*, 2021). Farmers who mix and apply pesticides, operate on agricultural land, or are otherwise exposed to chemicals run substantial health risks. The general public now faces a greater health risk from pesticide residues in food (Nweke, *et al.*, 2021) and water (Pimentel, 2005; Maroni *et al.*, 2006; Soares and Porto, 2009). Farmers in Bangladesh, like those in other developing nations, face significant health risks because of poisonous agrochemicals that are illegal or restricted in other nations, improper application methods, outdated or completely inappropriate spraying equipment, and poor storage practices (Asogwa and Dongo, 2009). In addition, several studies have shown that inadequate product labeling and users' lack of information have led to the widespread overuse and misuse of dangerous pesticides. Although monitored health data on the effects of pesticides projections suggest an annual incidence of organophosphate (OP) poisoning alone is as high as 900/100,000 population (Dasgupta and Meisner, 2005). In Bangladesh, the literacy rate is very low due to this less technical knowledge increases the contact of hazardous chemicals with farmers. Pesticide traders (shops) show that 90% of the traders indicated the need for further instructions on application and handling of chemicals, and over 92% indicated no protection measures were taken during the handling of pesticides (Dasgupta and Meisner, 2005). Unregistered firms and growers might be highly dangerous. These situations could have unexpected consequences including the exposure of consumers to health hazards (Claude *et al.*, 2012; Anjum *et al.*, 2019).

### Chemicals made from Organochlorine

Dichlorodi-phenyltrichloroethane, also known as DDT, is the most well-known organochlorine pesticide. Its unrestricted usage resulted in several environmental and human health problems. Other organochlorines that are employed as pesticides include methoxychlor, endosulfan, heptachlor,

dieldrin, and dicofol. Even though DDT is now illegal to use everywhere, it is still used in a few nations. DDT is also dissolved in several solvents for application. It is a chemical that is found everywhere, and it is thought that every living thing on Earth has some amount of DDT in their bodies, primarily stored as fat. Additionally, there is proof that DDT and its metabolite DDE may disrupt endocrine function, cause cancer, and affect neurodevelopment.

### **Chemicals made from Organophosphorus**

Pesticides that include organophosphates cover a wide range; glyphosate is one of the most often used. Other well-known pesticides in this class include dimethoate, parathion, and Malathion. This family of pesticides has also been linked to impacts on mitochondrial function, disturbance of normal cellular catabolism and anabolism of proteins nucleic acids, carbohydrates hormones, and lipids. According to population-based research, there may be a link between exposure to organophosphorus insecticides and major health problems such as cardiovascular disease and harm to male reproduction. An investigation into potential links between glyphosate, genetically modified foods, and declining health in the USA was recently published. Concerns concerning potential links between glyphosate usage and a variety of health issues and diseases, including cancer, kidney failure, blood pressure, and diabetes-related disorders. In addition, there are worries that glyphosate may contribute to gluten intolerance, a condition that raises the risk of non-Hodgkin's lymphoma development, reproductive problems, and a lack of important trace metals.

### **Chemicals made from Carbamates**

Carbamates are a class of chemicals that are commonly used in agriculture as insecticides, herbicides, and fungicides. They work by inhibiting the activity of an enzyme called acetylcholinesterase, which is important for nerve function in insects, plants, and some other organisms. Carbamates can be toxic to non-target organisms, such as bees, birds, fish, and mammals. This can result in unintended harm to important species in the ecosystem, potentially disrupting the balance of the ecosystem. Some carbamates can persist in the environment for long periods of time, potentially accumulating in soil and water. This can lead to long-term exposure for organisms that live in

these environments. Carbamates can also have health effects on humans who are exposed to them, such as through contaminated food or water. Symptoms of carbamate poisoning can include headaches, nausea, dizziness, and difficulty breathing.

### **Additional types of chemical pesticides**

Another group of chemical pesticides that have been linked to endocrine-disrupting effects and reproductive toxicity are triazines, which include atrazine, simazine, and ametryn. These chemical pesticides also affect on the metabolism of humans and cause of many diseases like cancer. Among the most perceptible health problems encountered in a survey, 16% of the respondents reported irritation in the eyes, 21% headaches, 6% dizziness, 5% skin irritation, and 7% vomiting after handling pesticides (Dasgupta and Meisner, 2005). Another survey report on pesticide poisoning in Dhaka Medical College Hospital from October 2005 to June 2006 showed that total pesticide poisoning cases were 10.33% and 16.7% of them died (Shadequl-Islam *et al.*, 2012) acute poisoning in the medicine ward of Khulna medical college hospital showed that the most commonly found toxic agent was organophosphate 27.64% second leading cause 16.03% (poisoning with unrecognized substance) followed by copper-sulfate 14.03%, sedative 13.35%, snakebite 12.93%, etc (Chowdhury *et al.*, 2011).

### **Impact of agrochemicals on environments**

#### **Adverse Effects on Water Quality**

Agrochemicals can contaminate surface and groundwater, leading to adverse effects on water quality (Das and Barua, 2021). Pesticides, herbicides, and fertilizers can leach into groundwater and surface water, leading to contamination and potentially harmful levels of these chemicals in drinking water (Wang *et al.* 2021).

#### **Adverse Effects on Soil Fertility**

Agrochemicals can also have adverse effects on soil fertility. Overuse of fertilizers can lead to nutrient imbalances in the soil (Arora, *et al.*, 2021) reducing soil fertility and crop yields over time. Excessive use of pesticides can also kill beneficial organisms in the soil, such as earthworms and microbes, leading to reduced soil health.

#### **Adverse effects on non-target animals**

According to a survey done in 1999, animals such as

reptiles, avians, insects, and mammals have been negatively impacted by aerial spraying (Sultana and Nobukazu, 2001). The detrimental effects of xenobiotics on the enzyme and hormonal systems of fish, amphibians, and reptiles have been extensively reviewed by Khan and Law (2005). Sub-lethal effects from glyphosate or glyphosate-containing goods, such as irregular swimming and breathing, enhance the likelihood that fish will be eaten. The herbicide 2,4-D impaired the capacity of rainbow trout to obtain food and induced physiological stress reactions in sockeye salmon (Little, 1990).

#### **Adverse effects on non-target plants**

By changing the existing species' equilibrium, agrochemicals can cause ecological disruption. This may cause non-target plant species to become extinct or decrease, which may have a domino effect on the environment. Herbicide 2,4-D, which may blow onto surrounding trees and shrubs' leaves, can harm them (Dreistadt *et al.*, 1994). Glyphosate exposure can significantly lower the quality of seeds (Locke *et al.*, 1995). Additionally, it may make some plants more susceptible to contracting diseases (Brammall and Higgins, 1988). Threatened plant species are particularly at risk from this. Contamination of water with herbicides might have catastrophic consequences for aquatic vegetation. Oxadiazon was reported to significantly inhibit algal growth in one study (U.S. EPA, 1996).

#### **Adverse effect on microbial community**

The populations of beneficial microflora might decrease as a result of overuse or extensive treatment of the soil with pesticides and other agrochemicals. According to Santos and Flores (1995), glyphosate inhibits the development and activity of free-living, nitrogen-fixing bacteria in the soil. For instance, pesticides can harm important soil bacteria while also aiming to kill or deter pests. Given the crucial role bacteria play in the cycling of nutrients and the decomposition of organic matter, this may result in a reduction in soil fertility. Additionally, some pesticides have a long half-life in the environment, which can have several ill effects on the society of microorganisms (Wang *et al.*, 2020). According to Fabra *et al.* (1997), 2,4-D decreases nitrogen fixation by microorganisms that reside on bean plant roots. Additionally, fertilizers can harm microbial communities, especially if they are used excessively. For instance, excessive nitrogen fertilizer usage can promote the development of

particular microbial species that can result in soil acidity and nutritional imbalances. Additionally, it inhibits the conversion of ammonia into nitrates (Martens and Bremner, 1993) and inhibits the growth and activity of nitrogen-fixing blue-green algae (Singh and Singh, 1989).

#### **Management**

The farmers can manage the administration of chemicals with their knowledge. Some management steps are the first one is to literate and give information about chemicals their effects and how to use of chemicals by the farmers through the Gov. and NGOs. Another is to reduce the drastic use of agrochemicals and their quantification (de Souza and da Silva, 2021). There are many different methods in which some plant parts like Neem leaves can be used as pesticides in the fields as an alternate source of chemical pesticides. Mechanical pest control is the management and control of pests means such as fences, barriers or electronic wires. Some mechanical methods like handpicking and less costly mechanical traps and insect attractors can be also used to reduce the infestation of insects in our fields. Another is integrated pest management; integrated weed management and integrated nutrient management can also be more effective on insect pests, weeds, and nutrient management in our fields. If we use living organisms like biofertilizers and biological control agents against chemicals then our crops and soil health may sustain a longer period of time. There are three basic strategies for biological pest control – importation, augmentation, and conservation. Some examples of biological control agents are predators including lady beetles, parasitoids including wasps or flies, and pathogens including pathogenic microorganisms like bacteria, fungi, and viruses. They kill or debilitate their host and are relatively host-specific.

#### **CONCLUSION**

Agrochemicals are used for instant action on insect pests and weeds but it may increase agriculture costs and may have bad effects on the environment as well as on humans also. These chemicals are persisting in our environment and our daily consumption of food items and pollute them (Hao *et al.*, 2021). These chemicals are very bad effects on human health. So, we need a new agricultural technique in which we can get healthy food. In

recent times, many countries do organic farming and the effect on the environment get good reports. If we keep our eyes on India, we get that Sikkim become the first organic state and the climate of Sikkim become very good. There are many areas in the world that do organic farming or chemical-free farming for example Mali village in Africa is another example. We can reduce the cost of agriculture by adopting IPM, IWM, and INM and also by using biofertilizers and biological control agents. In the case study of Punjab and Haryana if we look at the current situation of Haryana and Punjab the farmers used chemicals at very high doses and now the effects are seen on human health. There is a special train that runs from Bhatinda, Haryana to Bikaner, Rajasthan called as cancer train. On this train, we can see only cancer patients who are young, children, or old people belonging to Punjab and Haryana.

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