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IMPACT OF AGRICULTURE PESTICIDES ON HUMAN HEALTH AND ENVIRONMENT: BOON OR BANE

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ABSTRACT

Pesticides are a substance intended for preventing, destroying, repelling or mitigating any insects, rodents, nematodes, fungi or weeds or any other life form that declared as pest. After green revolution pesticides dependency have been increased in ample amount, which evidently have protected the crops from pests and crop yield reduction but simultaneously the adverse impact on health have shown e.g. Upper respiratory tract disease, Cancer, Tumour, Leukemia and impact on environment e,g, Soil, Water, Air pollution, hazards to non-target organisms and loss of biodiversity or ecological losses which are important for both socially and economically. Hence, we should minimize the use of pesticide and replace it with biopesticides. Biopesticide is ecofriendly approach for pest control.They pose less threat to the environment and to human health. Some example of biopesticides are trichoderma, phytopthora and bacillus thuringenesis.

KEYWORDS: Pesticides, Weeds, Green revolution, Upper respiratory tract disease, Cancer, Soil, Air, Water, pollution, Leukemia, Biodiversity, Biopesticides.

INTRODUCTION

As defined by the World Health Organization, "Pesticides are chemical compounds that are used to kill pests, including insects, rodents, fungi and unwanted plants (weeds). Any substances or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, nematodes, fungi or weeds or any other form of life declared as pest or any substances or mixture of substances intended for use as a plant regulator, defoliant or desiccant (Mentioned in Federal insecticide, fungicide, and rodenticide act FIFRA-1947). Pesticides are used in public health to kill vectors of disease, such as mosquitoes, and in agriculture, to kill pests that damage crops. The common type of pesticides include, insecticides which kill insects; herbicides which kill plants; rodenticides which kill rodents; fungicides which kill fungi; and larvicides which kill larvae.[1,2]

Classification[3]

BASED ON TARGET ORGANISMS	BASED ON MODES OF ENTRY	BASED ON MODE OF ACTION
1. Bactericides **2.** Fungicides **3.** Herbicides **4.** Insecticides **5.** Ovicides	**1.**Stomach poison e.g. Sulphur **2.**Contact poison- e.g. DDT	**1.**Nerve poison **2.**Muscle poison **3.** Physical poison

6. Adulticides **7.** Miticides **8.** Molluscidies **9.** Nematicides **10.** Rodenticides **11.** Virucides **12.** Avicides **13.** Algaecides	**3**.Systemic poisons- e.g. Macrotarphus **4**.Fumigants- e.g. Phosphine	**4**. Repellent **5**. Systemic poison **6**. Axion poison **7**. Synaptic poison

The practice of agriculture began thousands of years before with the cultivation and to protect crops from pests and diseases. The earliest recorded use of insecticides is by Sumerians about 4500 years, who used sulphur compounds to control insects. Since then pesticides have been the regular part of farming across the globe. With the excessive use of pesticides across the agriculture industry, the increasing number of researches have shown the harmful effects of pesticides.[4]

Advantages of pesticides

1. Improvement in production: Immense benefits introduced as outcomes by the use of pesticides in forestry, human health and the domestic sphere and of course agriculture. And our Indian economy is largely dependent on agriculture. Pesticides have been an integral part of the process by reducing losses from the weeds, diseases and insect pest that can markedly reduce the amount of harvestable produce.

2. Prevent from crop losses/yield reduction: Weeds reduce the yield of crops by 37-79%. Herbicides or weedicides prevent from this loss and provide an economic and labour benefit too.

3. Vector diseases control: Insecticides results in control of insects which spread deadly disease like malaria, dengue etc.

4. Other area- transport, sport complex, buildings: Insecticides protect buildings and other wooden structures from damage by termites and wood boring insects.[5]

Disadvantages of pesticides

Although we can't refuse the positive effects or beneficial results of using pesticides in agriculture and humans welfare, but unjudiciously or blind use of pesticides invites certain environmental and public health effects. Pesticides takes a distinctive position among environmental contaminants due to their high biological activity and toxicity. Most pesticides do not differentiate between pests and other living beings or non-target organisms. They are very harmful to humans, animals, other living organisms, and the environment if used in incorrect way. It is estimated that about 5000–20,000 people died and about 500,000 to 1 million people get poisoned every year by pesticides. At least half of the intoxicated and 75% of those who die due to pesticide are agricultural workers. The rest are being poisoned due to consumption of contaminated food.[6]

Adverse impact on human health: Pesticides are sprayed onto wheat, rice, vegetables, food etc through which they get accumulated into the soil as a result it pollute the groundwater and end up in contaminated drinking water .During the processing of spraying or mixing of pesticides through the various routes, pesticides can enter the human body like inhalation of air, dust and fumes; through dermal exposure by direct contact; oral exposure by consuming contaminated food and water. Toxicity of chemicals, length and magnitude of exposure determines the degree of harmful impact on human health. Toxicity of chemicals depends on the nature of toxicant, routes of exposure (oral, dermal and inhalation), dose and organism. Toxicity can be either acute or chronic.[7,8]

- **Acute effect**

Acute effect can be termed as when human will have single exposure of pesticides accidentally or unintentionally through lungs, skin, eye and oral. Symptoms of pesticides on the basis of route of entry.

Inhalation: Bronchoconstriction, Increased bronchial secretions, Pulmonary oedema.

Oral: Anorexia, Salivation, Nausea,Vomiting, faecal incontinence, Pancreatitis

Skin: Dermatitis, Irritation

Eye: Miosis, Pupil occasionally unequal or dilated[9]

About 3 million cases of acute poisoning due to pesticides are reported worldwide every year. Out of these 3 million pesticide poisoning cases, 2 million are suicide attempts and therest of these are occupational or accidental poisoning cases.[10]

- **Chronic effect**

When humans have long time exposure of pesticides in small dose over repeated period of time. The chronic symptom are leukemia, brain, kidney, breast, prostate, liver, lung and skin cancer, benign or malignant tumour, reproductive defects, congenital anomalies. This increased risk occurs with both residential and occupational exposure because there is equal chances of both agriculture farmers and general population (by pesticides residues in food or drifts from the field) of getting exposed. Continued and repeated exposure to sub lethal quantities of pesticides for a long period of time

(may be several years to decades), causes chronic illness in humans.[11]

Adverse impact on environment: Over 98% of sprayed insecticides and 95% herbicides reach a destination other than their target species because they sprayed or spread across entire agriculture fields. Extensive usage and dependency has widen its impact area because runoff can carry pesticides into aquatic environment and wind can carry to human settlements, grazing areas, potentially affect other areas. Overtime and repeated application increase pest resistance while its effect on other species can facilitate the pest resurgances.[12,13]

A) Impact on soil, air and water: The degraded pesticides interact with the soil and with its indigenous microorganisms, thus altering its microbial diversity, biochemical reactions and enzymatic activity. Any alteration in the microbial diversity and soil biomass eventually leads to the disturbance in soil ecosystem and loss of soil fertility.[14,15]

Pesticides contributes to air pollution. Pesticides drifts occurs when pesticides suspended in the air as particles are carried by wind to other areas. Increase wind velocity does the spray drift and low relative humidity and high temperature result in more spray evaporating.[16]

Pesticides that spray onto fields and used to fumigate soil can give chemicals called volatile organic compounds which can react other chemicals and form pollutant called Tropospheric ozone. There are four major routes through which pesticides reach the water, it may carried to the water as runoff, or it may get spilled accidentally, might get entry into groundwater through long time accumulation or leaching in soil, or may drift outside of agriculture field, industrial effluent or any other intended area.[17]

B) Impact on non-target organisms: Nitrogen fixation which is required for the growth of higher plants is hindered by pesticides in soil. The insecticides DDT, Methyl parathion and especially Pentachlorophenol have been shown interfere with legume-rhizobium (a chemical signalling). Wild animals dies when they enter field shortly after spraying for consumption of vegetables. Birds can be harmed when they eat insects, worms that have consumed pesticides. Pesticides have harmful effects on growth and reproduction of earthworm populations. For example, Carbamate insecticides are very toxic to earthworms and some organophosphates have been shown to reduce earthworm populations. Pesticides surface runoff into rivers and streams can be highly lethal to aquatic life. Herbicides such as copper sulphate can accumulate in bodies of water to levels that kill off zooplankton the main source of food for young fish. The destruction of these non-targets organisms can exacerbate pest problems. Pesticides affects behaviour and life history parameters including growth rate, development time and other reproductive functions of predators. Pollinators such as bees, fruit flies, some beetles, and birds can be used as bio-indicators of ecosystem processes in many ways as their activities are affected by environmental stress caused by pesticides application and habitat modifications. Over use of pesticides may hamper the populations of pollinators which lead to direct loss of insect pollinators and indirect loss to crops.[18,19,20]

C) Impact on biodiversity: Observing the hazardous effects of extensive use of pesticides on ecosystem, noteworthy changes can occur on any plant or animal species for example some species becoming extinct in that environment. In some case, a pesticide may eliminate a species essential to the functioning of the entire community,or it may promote the dominance of undesired species or it may simply decrease the number and variety of species present in the community. This may disrupt the dynamics of the food webs in the community by breaking the existing dietary linkages between species and collectively this all problems can lead to loss of biodiversity.[21]

Biopesticides: The need of hour is eco-friendly alternatives of pesticides i.e., biopesticides. Biopesticides or biological pesticides based on pathogenic microorganisms. It is an effective solution of problems of pest without threat to environment and human health. The pest resurgences is less and less harmful on beneficial flora. Biopesticides is biodegradable and self-perpetuating. Major biopesticides are Neem, Bacillus thuringenesis(Bt), Baculoviruses, Trichoderma, Trichogramma.[22]

CONCLUSION

Despite implementation of legislative determination of safe level use of pesticide, the real-life conditions witness considerable exposure to more than two agrochemicals simultaneously which may have synergistic effects on non-target organism, loss of biodiversity, ecological losses, and chronic illness. Some of the major diseases observed for example cancer, respiratory problems, metabolic diseases, congenital abnormalities, auto-immune disorders. These diseases depends on factors such as type of pesticide, the duration and route of exposure, and the individual health status. There is requirement of agricultural reforms and alternative sustainable approach to curb the increasing pesticide burden. Technological advancement to identify alternatives to chemical pesticides are expected to provide rational and safer crop management. For instance, a group of researchers discovered compounds derived from an insect Opathogenic bacterium, Photorhabdus, that have antimicrobial and Nematicidal properties that can potentially replace the use of harmful chemical pesticides. Hence, training to farmers should be implemented on how to use pesticides in systematic way, their harmful impact on health.They should minimize the use of pesticides and enhance the use of biopesticides.

REFRENCES

1. https://www.who.int/topics/pesticides/en/
2. https://www1.health.gov.au/internet/publications/publishing.nsf/Content/ohp-enhealth-manual-atsi-cnt-l~ohp-enhealth-manual-atsi-cnt-l-ch5~ohp-enhealth-manual-atsi-cnt-l-ch5.7
3. Reddy Narayan k.s. and murthy o.p.,The essential of forensic and medicine toxicology, 34th edition, The health science publisher, 2017; 484.
4. http://agrochemicals.iupac.org/index.php?option=com_sobi2&sobi2Task=sobi2Details&catid=3&sobi2Id=31
5. Impact of pesticides use in agriculture: their benefits and hazards, Aktar wasim md., sengupta dwaipayan and chowdhury ashim, setox.eu/intertox&versita.com/science/medicine/it/, 2009; 2(1).
6. FAO/WHO. Pesticide residues in food evaluations. Part II — toxicological. Joint FAO/WHO Meeting on Pesticide Residues. World Health Organization, Geneva, 2000.
7. Sacramento, C.A. Department of pesticide regulation "What are the Potential Health Effects of Pesticides?" Community Guide to Recognizing and Reporting Pesticide Problems, 2008; 27–29.
8. Lorenz, E.S. Potential health effects of pesticides. Agricultural Communications and Marketing, 2009; 1–8.
9. Reddy Narayan k.s. and murthy o.p.,The essential of forensic and medicine toxicology, 34th edition, The health science publisher, 2017; 485.
10. Singh, B. and Mandal, K. Environmental impact of pesticides belonging to newer chemistry. In: Dhawan, A.K., Singh, B., BrarBhullar, M. and Arora, R. (Eds.). Integrated pest management. Scientific Publishers, Jodhpur, India, 2013; 152–190.
11. PAN Pesticides and health hazards Facts and figures. Pesticide Action Network, Germany, GLS Gemeinschaftsbank, 2012.
12. Harrison, S.A. The fate of pesticides in the environment, Agrochemical Fact Sheet # 8, Penn, USA, 1990.
13. https://www.wikipedia.org/
14. Hussain, S., Siddique, T., Saleem, M., Arshad, M. and Khalid, A. Impact of pesticides on soil microbial diversity, enzymes, and biochemical reactions. Advances in Agronomy, 2009; 102: 159–200.
15. MunozLeoz, B., RuizRomera, E., Antiguedad, I. and Garbisu, C. Tebuconazole application decreases soil microbial biomass and activity. Soil Biology and Biochemistry, 2011; 43: 2176–2183.
16. Trajkovska, S., Mbaye, M., Seye, M.G., Aaron, J.J., Chevreuil, M. and Blanchoud, H. Toxicological study of pesticides in air and precipitations of Paris by means of a bioluminescence method. Analytical and Bioanalytical Chemistry, 2009; 394: 1099– 110.
17. Larson, S.J., Capel, P.D. and Majewski, M. Pesticides in surface waters: Distribution, trends, and governing factors (No. 3). CRC Press, 2010.
18. Kevan, P.G. Pollinators as bio-indicators of the state of the environments: Species, activity and diversity. Agriculture, Ecosystems and Environment, 1999; 74: 373–393.
19. Edwards, C.A. The environmental impact of insecticides. In: Delucchi, V. (Ed.) Integrated pest management, Protection Integàee Quo vadis? An International Perspective. Parasitis 86, Geneva, Switzerland, 1987; 309–329.
20. http://www.wikipedia.org/
21. Pesticides and the loss of diversity, Richard isenring, 2010.
22. Gupta suman and Dikshit a.k, Biopesticides and eco-friendly approach to pest control, Journal of biopesticides, 2010; 3(1): 186-188.