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HAZARDS OF AGRO CHEMICALS – A REVIEW

[1]Dr. Rashmi Tiwari MD (Ayu.)* and [2]Dr. Nitesh Gupta MD (Ayu.)

[1]Associate Professor, Dept of Agadtantra Government Ayurveda College Vadodara.

[2]Associate Professor, Dept of Kriya Sharir, Shri Gulabkubarba Ayurveda College Gujarat Ayurveda University, Jamnagar.

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***Corresponding Author**
Dr. Rashmi Tiwari
Associate Professor, Dept of Agadtantra Government Ayurveda College Vadodara.

ABSTRACT

Agrochemical or agrichemical, a contraction of *agricultural chemical*, is a generic term for the various chemical products used in agriculture. In most cases, agrochemical refers to the broad range of pesticides including insecticides, herbicides, fungicides and nematicides. It may also include synthetic fertilizers, hormones and other chemical growth agents, and concentrated stores of raw animal manure. Many important benefits are achieved by the use of agrochemicals. However, the use of certain agrochemicals has also been associated with some important environmental and ecological damages. Non-target exposures cause many unnecessary poisonings and deaths of organisms that are not agricultural pests. In addition there is a widespread, contamination of the environment in the form of residues with some types of persistent pesticides, in virtually all wildlife, well water, food and even in humans. Residues of some of the chemicals used in animal husbandry are also believed by some people to be a problem. To prevent excessive exposure to such chemicals and to avoid their hazards organic farming is a better alternate. The concept of organic farming is not new in Indian culture as in ancient India there were several methods mentioned for organic farming. Also for curative measures the concept of *Ayurveda* like *shodhana* (purification) therapy and *dooshivisha* (denatured poison) can be relayed upon.

KEYWORDS: agro chemical, hazards *Ayurveda.*

INTRODUCTION

Agrochemicals refer to inorganic fertilizers and pesticides. In the wake of green revolution, used of inorganic fertilizers and pesticides has increases enormously for enhancing crop production. An agrochemical is defined as a chemical such as a fertilizer, hormone,

fungicide, insecticide or soil treatment that improves the production of crop. An agrochemical is a substance used to manage an agricultural ecosystem. Poisoning due to agricultural chemicals is a main concern in today's perspective as the use of chemical in the form of pesticides and fertilizers has become an integral part of modern agriculture. The use of fertilizers in agriculture is intended to increase the yield. Pesticides are used in order to protect the plants from pests.[1]

Agriculture mortality rates have remained consistently high throughout the world in the last decade in contrast to other dangerous occupations.[2] Farm workers are at a very high risk of occupational diseases due to exposure to pesticides resulting from inadequate education, training and safety systems. In developed countries such as the US, farmers and farm workers comprise only 3% of the workforce, but they account for as much as 8% of all work-related accidents.[3] Developing countries are known to consume less than 20% of the world production of agrochemicals, which are responsible for as much as 1.1 million (70%) of the total cases of acute poisoning in the working population.[4] The World Health Organization (WHO) estimates that acute pesticide poisoning (APP) affects 3 million people and accounts for 20,000 unintentional deaths per year, with 99 percent of these fatalities believed to be in developing countries.[5]

There are various ways to group pesticides, including classification based on the pests they control. Some example, insecticides combat insect growth or survival, herbicides act against plants, weeds and grasses, rodenticides tight against rats and other rodents, avicides act against bird populations, fungicides attack fungi and nematicides combat nematodes. Pesticides grouping can also rely on their chemical structure. Organophosphorus (chlorpyrifos and diazinon), carbamates (carbaryl and aldicarb), organochlorine (DDT and aldrin), pyrethrins and pyrethroids (cyfluthrin and cypermethrin), benzoic acids (dicamba), triazines (atrazine and simazine), phenoxyacetic derivatives (2,4-D), dipyridyl derivatives (diquat and paraquat), glycine derivatives (glyphosate), and dithiocarbamates (maneb and ziram).[6]

Pesticides that bear similar chemical structures exhibit similar mechanism of toxicity and physicochemical properties, as well as comparable fate and transport properties. Pesticides belonging to different chemical classes but which have similar toxic effects, such as the ability to induce oxidative stress and act as endocrine disrupters will be treated as well.

EFFECTS ON ENVIRONMENT

The fate, on application, of pesticides in the soil and the transport processes involved depend on the cumulative effects of the pesticide's characteristics (e.g., adsorptivity, solubility, volatility and degradation rate), the soil's characteristics (e.g., texture and organic matter), the application methods used (e.g., aerial or ground) and the site conditions (e.g., topography, weather and irrigation).[7] Certain pesticides, which are more resistant to degradation by a biotic (physical, chemical and other factors) and biotic (living organisms i.e. the micro, meso and macro organisms of the soil food web) agencies, leach into the lower strata of the soil, are absorbed by plant roots, accumulate in the food chain and are ultimately biomagnified in the food web. There have been several reports on the accumulation of pesticide residues in plant and animal tissues. The applied pesticide can be transported from the sprayed area to non-target areas away from the crop, which thus affects not only pest species, but potentially non-target endangered species also.[8]

Pesticides, when not judiciously used, may disrupt natural biological pest control mechanisms. More vigorous pest attacks may result, along with heavier chemical use and increased health exposures. Pesticides, as well as fertilizers, can infiltrate water sources – contaminating drinking water and animal species, e.g. fish, upon which humans rely for nutrition. Such contamination can lead to a range of secondary public health impacts.

EFFECTS ON HUMAN

The effects of pesticides on human health depend on the toxicity of the chemical and the length and magnitude of exposure.[9] Farm workers and their families experience the greatest exposure to agricultural pesticides through direct contact. Every human contains pesticides in their fat cells.

Children are more susceptible and sensitive to pesticides[10], because they are still developing and have a weaker immune system than adults. Children may be more exposed due to their closer proximity to the ground and tendency to put unfamiliar objects in their mouth. Hand to mouth contact depends on the child's age, much like lead exposure. Children under the age of six months are more apt to experience exposure from breast milk and inhalation of small particles. Pesticides tracked into the home from family members increase the risk of exposure. Toxic residue in food may contribute to a child's exposure.[11] The chemicals can bio accumulates in the body over time.

Exposure effects can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, coma or death.[12] Developmental effects have been associated with pesticides. Recent increases in childhood cancers in throughout North America, such as leukaemia, may be a result of somatic cell mutations.[13] Insecticides targeted to disrupt insects can have harmful effects on mammalian nervous systems. Both chronic and acute alterations have been observed in exposes. DDT and its breakdown product DDE disturb estrogenic activity and possibly lead to breast cancer. Fetal DDT exposure reduces male penis size in animals and can produce undescended testicles. Pesticide can affect foetuses in early stages of development, in utero and even if a parent was exposed before conception. Reproductive disruption has the potential to occur by chemical reactivity and through structural changes.[14]

PREVENTION AND MANAGEMENT

The complete exposure to the agro chemicals is unavoidable in present circumstances and thus their effects also, but their effects can be controlled by the use of proper preventive measures. Once starting the toxicity symptoms, the person should be removed from the exposure site as early as possible and treatment should be provided as per condition. Decontamination of poison is a prime importance in all the cases whether acute or chronic. If the type of chemical is known then the treatment becomes easier, but in case of unknown chemicals general treatment principles can be applied. Administration of adsorbents is an alternative –adsorbents can bind to the toxic agent, to form a stable compound. This compound is not absorbed by the gastrointestinal tract and is subsequently excreted with the feces.

Preventive measures primarily includes; following the instructions given by manufacturer, keeping pesticides away from daily useable articles, container should be tight enough to avoid leakage and empty containers should not be used of any other purpose. The use of protective gloves, gown and glasses helps a lot in protection against unwanted exposure to agro chemicals.[15]

Alternately, the use of organic substances in farming, instead of chemicals is much safer and effective method to protect environment as well as the human health. Organic farming relies on fertilizers of organic origin such as compost, manure, green manure and bone meal and places emphasis on techniques such as crop rotation and companion planting. Biological pest control, mixed cropping and the fostering of insect predators are encouraged. In general,

organic standards are designed to allow the use of naturally occurring substances while prohibiting or strictly limiting synthetic substances.[16]

The concept of organic farming is not very new in Indian culture. In ancient India, there was a separate branch related to the plants by the name "*Vrksayurveda",* literally 'means the science of plants life'. clear references to the *Vrksayurveda* is met with in the *Arthsastra*, the *Brhatsamhita* and in the *Agnipurana*, each having a section devoted to this branch dealing with the Agricultural practises; rules of planting trees- their proper season and specific location for aesthetic and hygienic improvement of the home-stead; as well as diseases of plants and their treatment. Surapal's *Vrikshayurveda* is a systematic composition starting with the glorification of trees and tree planting.[17] Latter it includes topics related to the nourishment and fertilizers, plant protection from internal and external diseases including insects and rodents. According to the *Surapala*, "to remove insects both from the roots and branches of the trees, wise men should water the trees with cold water for seven days. The insects can be overcome by the paste of milk, *kunapa* water and cow dung mixed with water and also by smearing the roots with the mixture of white mustard, *vaca*, *kusta* and *ativisa*. The insects accumulated on trees can be treated quickly by smoking the tree with the mixture of white mustard, *ramatha*, *vidanga*, *vaca*, *usana*, and water mixed with beef, horn of a buffalo, flesh of a pigeon and the powder of *bhillata* (*bhallataka*?). Anointing with *vidanga* mixed with ghee, watering for seven days with salt water and (applying) ointment made out of beef, white mustard and sesame destroys the worms, insects, etc."[18] Similarly, to improve the fertility of plants and high yield various method and remedies are mentioned in the text.

Ayurveda not only deals in the preventive measures but also describes curative measures. Qualities of different types of land, air water and crops are clearly mentioned in ancient *Ayurvedic* text. The features of polluted or impure land air and water are also mentioned in different context. Once the land is get polluted by the excessive use of agro chemical it should be treated as per the treatment of poisoned land which is mentioned in the context of poisoned land during the warfare.[19] The humans and animals those are affected by the effect of poisoned land should be treated with *shobhanjan mooladi agad.*[20] While dealing with the chronic conditions of poisoning *Ayurvedic* toxicology has its unique concepts of *Dooshivisha* (denatured poisons). It is the poison that remais in the body for long time and vitiated *dosha* in favourable conditions. This poison may be animate, inanimate or artificial. The main line

of treatment of dooshivisha includes *shodhana* (purification) therapy along with the use of specific drugs.[19] *Shodhana* procedures cleanes the body and eliminate the deposited or undeposited wastes and unwanted elements from the body. Thus in acute or chronic posining of agro chemical this can be used effectively.

CONCLUSION

Currently, there is a pursuit of a sustainable society, generating huge concern for human health just like the environment, this occurs due to action/persistence of pesticides in the environment, as well as its toxic effects to humans and other living beings. This pursuit for a healthier society tries to combat the toxic effects of pesticides, as they have caused a large reduction in biodiversity (mainly insects pollinators) and affect humans causing genetic mutations, Mutagenicity and carcinogenicity, reproductive damages as well as disturbances behavioural (depression and suicides). Faced with this problem, many governments have sought to measures to limit access to these compounds, aimed at protecting human and environmental health. This concern can also be viewed on the growing interest of researchers and regulatory agencies regarding research related to bio pesticides and biological control of pests, also seeking the quality of environmental and human health mainly in the near future. *Ayurveda* has its own potential and concept in concern with agro chemical and can be used as much effective and safer way to control the worsening situations. *Ayurveda* not only talks about the preventions but also mentioned the curative measure thus the air water or land which is already suffering by the harmful effects of chemical can be treated by purification methods mentioned by our great ancestors. For treating patients suffering from the effects of such impure environment specific remedies and procedures are mentioned. The need of the hour is that the ancient science of India should be studied thoroughly and used accordingly in concern with present scenario.

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