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# ECOTOXICOLOGY

# **BIOCHEMICAL EFFECTS OF PESTICIDES- CARCINOGENS**

# INTRODUCTION

- ◎ *Ecotoxicology is the study of the effects of toxic chemicals on biological organisms, especially at the population, community, ecosystem level.*
- ◎ *Ecotoxicology is a multidisciplinary field, which integrates toxicology and ecology.*

- ◉ In those ecosystems that are already impacted by pollution ecotoxicological studies can inform as to the best course of action to restore ecosystem services and functions efficiently.

# BIOCHEMICAL EFFECTS OF PESTICIDES

- ◉ *The environmental impact of pesticides is greater than what is intended by those who use them.*
- ◉ *Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non target species, air, water, bottom sediments, and food.*
- ◉ *pesticide can contribute to air pollution.*

- ◎ *Pesticides that are applied to crops and volatilize and may be blown by winds into nearby areas ,potentially posing a threat to wildlife.*
- ◎ *The biochemical effects of pesticides involves, the effects in Water, Soil,Plants,Animals,Birds,Aquatic life, Amphibians & Humans.*

# CARCINOGENS

- The agents which cause cancer are called as carcinogen and the phenomenon of cancer formation is called as carcinogenesis.

## Classification of carcinogens

1. Based on the functional Aspects
2. Based on mode of Action
3. Based on origin
4. Based on potency



I. Based on the functional Aspects

- 1) procarcinogen
- 2) Proximate carcinogen
- 3) Ultimate carcinogen
- 4) Synergistic carcinogen
- 5) Co-carcinogen
- 6) Anti-carcinogens

## II. BASED ON MODE OF ACTION

1. Genotoxic carcinogens
2. Epigenetic carcinogens

### III. BASED ON ORIGIN

1. Synthetic or man-made carcinogens
2. Natural carcinogens

## IV. BASED ON POTENCY

1. Proved carcinogens
2. Suspected carcinogens
3. Potential carcinogens

# WATER

- Pesticides were found to pollute every streams.
- *Pesticide residues have also been found in rain and ground water.*
- *There are four major routes through which pesticides reach the water: it may drift outside of the intended area when it is sprayed, it percolate, or leach, through the soil, it may carried to the water as runoff, or it may be spilled*

- They may also be carried to water by eroding soil.
- Factors that affect a pesticide's ability to contaminate water include its water solubility

# SOIL

- Many of the chemicals used in pesticides are persistent soil contaminants, whose impact may endure for decades and adversely affect soil conservation.
- The use of pesticides decreases the general biodiversity in the soil.
- Depending on the chemical nature of the pesticide, such processes control directly the transportation from soil to water, and in turn to air and our food.

- Breaking down organic substances ,degradation, involves interactions among microorganisms in the soil.



## *EFFECT ON PLANTS*

- Nitrogenfixation, which is required for growth of higher plants, is hindered by pesticides in soil.
- the insecticides DDT, methyl parathion, and especially pentachlorophenol have been shown to interfere with legume-rhizome chemical signaling.
- Reduction of these symbiotic chemical signaling results in reduced nitrogen fixation and thus reduced crop yields.

- ⦿ Pesticides can kill bees and are strongly implicated in pollinator decline, the loss of species that pollinate plants, including through the mechanism of colony collapse Disorder, in which worker bees from a beehive or Western honey bee colony abruptly disappear .
- ⦿ Application of pesticides to crops that are in bloom can kill honeybees, which act as pollinators.

## EFFECT ON ANIMALS

- Pesticides inflict extremely widespread damage to biota, and many countries have acted to discourage pesticide usage through their Biodiversity Action Plans.
- Animals may be poisoned by pesticide residues that remain on food after spraying.
- Widespread application of pesticides can eliminate food sources that certain types of animals need, causing the animals to relocate, change their diet, or starve.

- ⦿ Poisoning from pesticides can travel up the food chain; for example, birds can be harmed when they eat insects and worms that have consumed pesticides.
- ⦿ Earthworms digest organic matter and increase nutrient content in the top layer of soil.
- ⦿ They aid in protecting human health by ingesting decomposing litter and serving as bio indicators in soil activity while creating a richer environment.

- ◎ A number of studies have shown that pesticides have harmful effect on growth and reproduction on earthworms, which are in turn consumed while terrestrial vertebrates such as birds and animals small mammals.
- ◎ Some pesticides can bio accumulate or build up to toxic levels in the bodies of organisms that consume them over time, a phenomenon that impacts species high on the food chain especially hard.

# BIRDS

- The fish and wild life service estimate that 72 million birds killed by pesticides in the united states each year
- Bald eagles are common examples of non target organisms that are impacted by pesticides use.
- RACHELCARSON'S landmark book silent spring dealt with the loss of bird species due to bio accumulation of the pesticides in the tissues.

- Reduction in bird population have been found to be associated with times and areas in which pesticides are used.
- Some pesticides are come in granular form, and birds and other wildlife may eat the granules, mistaking them for grains of food.
- A few granules of a pesticides is enough to kill a small bird.

# AQUATIC LIFE

- Fish and other aquatic biota may be harmed by pesticide-contaminated water.
- Pesticides surface runoff into rivers and streams can be highly lethal to aquatic life, some times killing all the fish in a particular stream.
- Applications of herbicides to bodies of water can cause fish kills when the dead plants rot and use up the waters oxygen, suffocating, the fish.



- Some herbicides, such as copper sulfite, that are applied to kill plants are toxic to fish and other animals at concentrations similar to those used to kill plants.
- Repeated exposure to sub lethal doses of some pesticides can cause physiological and behaviour changes in fish that reduce populations.

# AMPHIBIANS

- In the past several decades, decline in amphibians has been occurring all over the world, for unexplained reasons which are thought to be varied but of which pesticides may be a part.
- mixtures of multiple pesticides appear to have a cumulative toxic effect on frogs.
- Tadpoles from ponds with multiple pesticides present in the water take longer to metamorphosis into frog and are smaller when they do, decreasing their ability to catch prey and avoid predators.

# HUMANS

- Pesticides can enter the human body through inhalation of aerosols, dust and vapour that contained pesticides, through oral exposure by consuming food and water, and through dermal exposure by direct contact of pesticides with skin.
- pesticides are sprayed on to food, especially fruits and vegetables, they secrete into soils and ground water which can end up in drinking water, and pesticides spray can drift and pollute the air.

- The effect of pesticides on human health are more harmful based on the toxicity of the chemical and the length and magnitude of exposure.
- Farm workers and their families experience the greatest exposure to agricultural pesticides through direct contact with the chemicals.
- But every human contains a percentage of pesticides found in fat samples in their body

- Exposure to pesticides can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, and even coma or death.
- Developmental effects have been associated with pesticides.
- Recent increases in childhood cancers in throughout North America, such as leukemia, may be result of genotoxic and non genotoxic pesticides due to somatic cell mutations.

- Insecticides targeted to disrupt insects can have harmful effects on the nervous systems of mammals, due to basic similarities in system structure.
- Both chronic and acute alterations have been observed in those who are exposed
- Pesticides can act in the promotion and proliferation of cancer while causing hormone imbalance.
- DDT and its breakdown product DDE, with levels still present in the environment, despite its ban, are known to disturb estrogenic activity and possibly lead to breast cancer

A close-up photograph of a bouquet of flowers. The bouquet includes several bright yellow daisies and several vibrant pink chrysanthemums. A white card is tucked into the flowers, featuring the words "Thank You" written in a black, elegant cursive font. The background is a soft-focus green, suggesting foliage.

*Thank You*