

EFFECTS AND CONSEQUENCES OF PESTICIDE USE AND BIOCHEMICAL MEASURES OF PROTECTION

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Abstract

Pesticides are chemical compound, which are used for destroying plants and other pests. Pesticides are used to help human to arise income in feeding, protect environment in "fight" against harmful pests. A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. A pesticide may be a chemical substance, biological agent (such as a virus or bacterium), antimicrobial, disinfectant or device used against any pest. Pests include insects, plant pathogens, weeds, molluscs, birds, mammals, fish, nematodes (roundworms), and microbes that destroy property, spread disease or are a vector for disease or cause a nuisance. Although there are benefits to the use of pesticides, there are also drawbacks, such as potential toxicity to humans and other animals. According to the Stockholm Convention on Persistent Organic Pollutants, 10 of the 12 most dangerous and persistent organic chemicals are pesticides. Pesticides are all around us - in the air, land, house, and water. And if we expect them the most food of plant origin, they simply enter the entire food chain and keep it for a long time because of their persistence and slow degradation. Pesticides influence on eco system and environment in whole is very complex process, and in this work we are take into consideration factors oh human health with adequate measures for prevention, chemical protection from remediation.

Key words: pesticides, environment, pollution, contamination, remediation, protection and work health

INTRODUCTION

Pesticide products under the mean chemical or biological origin that are intended for bio-chemical protection of important plants and animals from weeds, diseases, pest insects, mites and other harmful organisms. Any use of pesticides also carry negative consequences for the ecosystem in which it applies and the surrounding ecosystems. Reducing use of pesticides is one of the foundations of sustainable agriculture and the idea of sustainable development.

FAO has defined the term of *pesticide* as: "Any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature

fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport".

Therefore, pesticides are chemical and microbiological means used to combat the cause of plant diseases, pest insects, mites, centipede, snails, nematoida and rodents, for the suppression of weeds or for regulating plant growth. Apart from the protection of plants are used for destroying insects and other organisms that transmit pathogens of infectious diseases in humans and animals (eg mosquitoes).

There are numerous chemical agents to destroy parasites, causing diseases of plants, a variety of pests such as insects, rodents and birds, and weeds (herbicides) are called pesticides. They are toxic even in very small quantities, because in their use, let us be very careful, otherwise we could seriously jeopardize not only their own, but other people's health and the environment. Thus, depending on the purpose, pesticides share in subgroups of which are represented most insecticides (against insects), herbicides (for weed destruction) and fungicides (against fungal diseases).

Pesticides are all around us - in the air, land and water. While most expect them to food of plant origin, they simply enter the entire food chain and keep it for a long time because of their persistence and slow degradation.

The purpose of a pesticide is usually to kill or repel some form of life. The US Environmental Protection Agency's definition of a pesticide is as follows: "A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. Though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides, and various other substances used to control pests." Pesticide formulations contain both "active" and "inert" ingredients. Active ingredients are what kill the pest, and inert ingredients help the active ingredients to work more effectively.

The two largest classes of synthetic pesticides are insecticides, which are designed to kill insects, and herbicides, which are designed to kill plants. Other classes of pesticides include fungicides (for molds and fungi), rodenticides (for mammals), and antimicrobials (for microorganisms such as bacteria and viruses). Antimicrobial pesticides are used as preservatives, sterilizers, and disinfectants in home, institutional, and commercial environments. (For more information on antimicrobial pesticides, see this EPA website. Note that pharmaceuticals intended to kill organisms in the body, such as bacteria and parasitic worms, are not defined as pesticides and are regulated as drugs.)

Pesticides work by interfering with an essential biological mechanism in the pests, but because all living organisms share many biological mechanisms, pesticides are never specific to just one species. While pesticides may kill pests, they may also kill or harm other organisms that are beneficial or at least not undesirable.

They may also harm people who are exposed to pesticides through occupational or home use, through eating foods or liquids containing pesticide residue, or through inhaling or contacting pesticide-contaminated air. The ideal pesticide would be highly specific to only the target organism, be quick acting, and would degrade rapidly to harmless, inert materials in the environment.

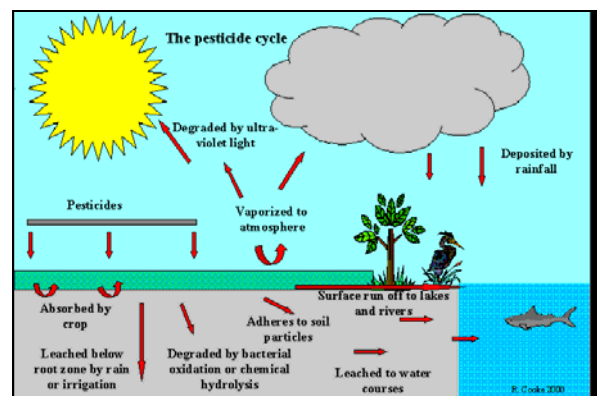


Figure 1. The life cycle of pesticides and the impact on biocoenosis

CHARACTERISTICS OF PESTICIDE

Treatment plant pesticides, and that does not comply with instructions on how to use the waiting period, when the pesticide is released into the animal or human body, and sooner or later may cause undesirable changes. According to the chemical composition of pesticides are divided into:

- Inorganic substances derived from plants, bacteria and fungi,

Synthetic organic materials which belong to the organo-hlorirani pesticides,

Organophosphorus pesticides, triazini, derivatives fenoksi-hydrocarbon acid piretroidi et al.

There are certain parameters that are related to the input of pesticides in the body, as well as to the content of pesticides in food:

a) DDD (allowable daily dose) or ADI (available daily intake) which is expressed in mg / kg human body weight / day, and the amount of pesticide residues in long-term inclusion in the body is not a threat to human health. ADI value is determined on the basis of animal studies, taking into account the so-called. "Safety factor" to which the results obtained in animals decreased by 50 to 500 times. ADI values are adjusted at the level of international organizations.

b) (K) the amount of pesticide residues allowed in each type of food is calculated from allowed daily dose (ADI), the average amount of food consumed daily (Q) and the average human body weight (70 kg).

$$K = \text{ADI} \times 70 \times 1000 / Q \text{ (mg / kg - ppm)}$$

K-value of the toxicological limit - all values above the limit can be harmful to health

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In terms of application of pesticides in the environment are often present and Polychlorinated biphenyls (PCBs). This is a group of chemical compounds in which one or all 10 hydrogen atoms from molecules biphenilne replaced with chlorine atoms. PCBs are closely associated with dioxins and show a similar toxicity as dioxins, highly stable and longstanding poisons. Cause the decline of immunity, hair loss, neurological disturbances in the system.

PCBs are present in foods in very small concentrations and in meat, fish and dairy products, and entering the body adipoznom accumulate in tissue. Polihlorirani biphenyls are widely used as carriers of heat, pesticides, rubber and plastic additives, as well as industrial oils, paints and varnishes and the possible arrival of the roads in a variety of foods.

Some quick definitions:

Solution – A liquid or solid chemical which is dispersed completely (not suspended) in water or another fluid. For our purposes this

includes water solutions and ester or other oil-soluble chemical dissolved in oil;

Suspension – Finely divided solid particles or liquid droplets dispersed (but not dissolved) in another solid, a liquid or a gas;

Emulsion – A suspension of small droplets of an oil-based or an ester pesticide in water;

Invert Emulsion – A suspension of small droplets of water in an oil. Some chemicals are now produced as invert emulsions.

Generally the formation of an invert emulsion is undesirable. Without special precautions during mixing and use they commonly form resulting in a sludge of the approximate consistency of mayonnaise that clogs hoses and nozzles and creates a major problem of clean-up.

Solution – Dissolved - Does not separate	Suspension – Mixed - Can separate
Emulsion – Oil droplets in water	Invert Emulsion – Water droplets in oil

Gross Classification of Pesticides by Chemistry: Inorganic pesticides, Organic pesticides, Biological pesticides.

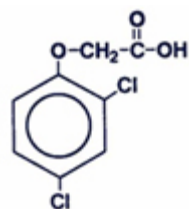
Inorganics: Molecules do not contain carbon, Heavy metals – lead and arsenic, Copper products, Sulfur products.

Organics: Molecules contain carbon, May be chains or rings.

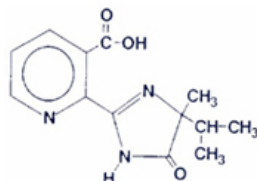
Biologicals: Viruses, bacteria, fungi, and plants, Nematodes, insects and other parasites or predators.

Classification of Organic Herbicides by Chemistry: Phenoxy herbicides, Triazines, Imidazolinone, Sulfonylureas.

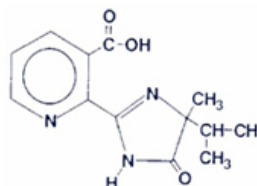
Phenoxy herbicides:
2,4-D, 2,4-DP, 2,4,5-T
Behaves as an auxin causing
hypertrophy
Sample structure



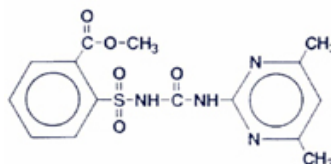
Triazines:
Hexazinone
Have extreme soil mobility
Structure



Imidazolinone :
Imazapyr
Structure



Sulfonylureas:
Metsulfuron & sulfometuron methyl
Sample structure



Classification of Organic Insecticides by Chemistry: Chlorinated hydrocarbons, Organophosphates, Carbamates

Chlorinated hydrocarbons: Dieldrin, aldrin, DDT, mirex, chlordane, Sample structure.

Organophosphates: Malathion, azinphos-methyl, naled, Sample structure.

Carbamates: Carbaryl (Sevin), Structure.

2 Basic Chemical Groups for Herbicides: Amines, Esters.

Amine (General Characteristics): Organic salt, Water soluble, Low volatility, Low in its toxicity to fish, Used for injection & cut-surface treatments.

Esters (General Characteristics): Oil based, Oil soluble / can be emulsified in water, Generally highly volatile, Highly toxic to fish, Used for bark & foliar applications.

Amine: Organic salt, Water soluble, Low volatility, Low toxicity for fish, Injection & cut-surface treatments.

Ester: Oil based, Oil soluble or can be emulsified in water, High volatility, High toxicity for fish, Bark or foliar applications.

Frequently mentioned contaminants that are found in foods are polycyclic aromatic hydrocarbons (PAH). They represent a large group of organic compounds containing two or more connected aromatic ring consisting only of carbon and hydrogen. Formed during the

incomplete combustion or pyrolysis of organic matter in industrial processes and household. They have a strong cancer and genotoxic potential. PAH's in food can come from environmental and food processing.

Soil derived from materials which are used for agricultural purposes (pesticides) to protect plants from diseases and pests, and incompetent use. This problem usually occurs when using pesticides in an inadequate manner, since they are used by all individuals, without special explanations for their use. On that occasion should be legally regulated market of pesticides in agricultural chemists, materials to be used for agricultural purposes must strictly control the purchase and their use.

Pesticides and their metabolites, which are usually located on the ground and USEPA's listed as pollutants of the environment. Massive application of pesticides, particularly the cultivation of plants and animals there is a wide range of environmental contamination, especially food and water. Many factors influence the absorption of toxic substances from food and toxic effects of these substances. Among the most important factors are the concentration of toxic substances or doses, length of exposure-retention, physical-chemical properties, time of entry, individual resistance and others.

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Pesticidnih toksikanta particles of food can be molecules, atoms and ions. To demonstrated its toxic action must pass through the digestive tract epithelium. The main mechanism of absorption toksikanata proceeds from the particles passing through the membrane of the station causing toxic changes in the body. Toxic changes may be: iritantnost, alergičnost, Corrosivity, teratogenicity, embryotoxicity, genotoksičnost, carcinogenicity, mutagenicity, etc.. Teratogenicity is characterized by malformations of the fetus. Teratogenic period is going on in a very narrow period of fetal development. Mutacijsko effect of pesticides has an impact on the change of gene structure and genetic properties of living organisms with long-term effects on offspring. The most common carcinogenic dioxins in food have, nitrites, benzolni compounds, heavy metals and mycotoxins.

Heavy metals in pesticides are known because they have a higher density of 5 g/cm³. The food can be found as part of environmental contaminants. Heavy metals where the food is often contaminated are: lead (Pb), mercury (Hg), cadmium (Cd) and arsenic (As).

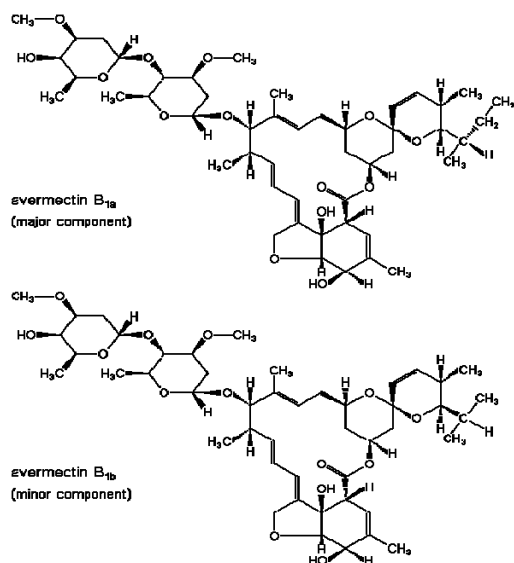
Lead is stored in bones and to a lesser offense in the liver, kidneys and soft tissues. Lead poisoning affects the function of the brain and nervous system, reduces the level of intelligence, power and memoriranja observations. The most severe forms of causing death.

Mercury (Hg) is a heavy metal that occurs most frequently in the food use of pesticides. Mercury is toxic and as a fundamental and all its connections. Symptoms of poisoning occur in the digestive organs, and in the nervous system.

Cadmium (Cd) in food comes from natural sources. High doses of cadmium in the kidneys causing kidney damage tissue, affects the development of calculus in the kidneys and increase the pressure. Cadmium affects the bone structure leading to their deformation. A common cause of anemia, heart and kidney damage, and is carcinogenic.



Figure 2. Pollution of watercourses with pesticides



Molecular pesticides structure- Avermectin

CHEMICAL PROTECTION MEASURES

In the case of the pesticide in the effluent above the MDK, do the following:

- Repeat the analysis for the presence of pesticides,
- Alarm accredited organization that deals with this issue,
- Do not drop water from vodoprijemnika the recipient, and not find a solution to this problem,
- On the way to bring the concentration of pesticide residues in the effluent at the border under MDK,
- To remind ourselves, as people defended their fruits, vegetables and flowers long before toxic pesticides.

Under the pesticides, in terms of the new Rules, means the chemicals that are used:

- anti-causing plant diseases, pests, pregljeva, centipede, snails, nematodes, rodents and birds, to suppress weeds or plant growth regulation;
- for the destruction of pests and fungi that attack stored agricultural products;
- to destroy insects and other organisms that cause infectious disease transmitted to humans and animals, respectively parasites in humans and animals.

Under the pesticides, according to this regulation, means and products of biotransformation of pesticides, and pollution in the finished product.

Under the new law on food safety, manufacturers must have evidence, that the analysis of the quality and health safety of food, before the release of the products. The law provides for a transitional period of two years to adjust to the new system of production and operations. After that, farmers will have to be entered in the register of producers, will be required to keep accurate data on production and trade in foodstuffs, to regularly control the presence of harmful organisms and keep the required documentation for five years.

Also, it will be obliged to keep records of production and a book on the treatment means for plant protection, for example, the waiting period for harvest date, the amount of pesticides used and the like and to collaborate with professional service to fit the new rules of law.

Will work in complete control of all products of plant origin. How important do control the fruits of pesticide residues and heavy metals, is equally important to examine the quality of soil, water, seeds and the trees.

Bearing in mind that pesticides whose incorrect application of resources easily leads to harmful effects on man and his environment is necessary to know how to handle them

properly. Before each use, you need to be properly protected, or wear protective clothing, gloves and protective goggles. Funds to prepare for it specifically intended for the room, sheltered from the wind, especially when it comes to powder products. If you need to mix use containers that are used only for pesticides. The same applies to the glass gauge or other measuring containers. After use all apparatus / sprayers and tanks / need a good wash.



Figure 3. Packages pesticides for agricultural purposes

During treatment, do not eat, drink and smoke. Do not perform the treatment in extremely hot and windy weather, watch the drift of neighboring cultures, gardens and parks (in urban areas), and so on. Upon completion of the treatment of sprinklers to wash with warm water, remove protective clothing and other protective equipment and the forests with warm water.

The funds are kept in the original and well packaging, well locked, dry and room, away from sources of fire, out of reach of children and person, separate from food, beverages and feed. Empty cans are rinsed at least three times and the liquid is added for spraying liquids, and then drill to be made useless. Such packaging is collected and secured in a certain place in separate containers.

In modern times, at the present time, achieving high yields can not be imagined without the use of mineral fertilizers and pesticides to combat diseases, pests and weeds.



Figure 4. Proper handling of the chemical protection measures

Excessive use of fertilizers adversely affect the properties of the soil and the like. Therefore, we recommend greater use stajskog fertilizer, not only has the function of plant nutrition, but also repair the physical and chemical properties of soil. Protection of the compost improves soil fertility, increase the humus content and microbiological activity of soil structure and water-air regime of soil.

Some rules of bio-chemical protection:

- never primenjmo pesticides nismoe sure that if we do it properly;
- sure, every time, README instructions and it is strictly;
- never pen sprayer to water current (river, stream, etc.).

When treated crop, particularly honey plants, be sure to notify beekeepers.

The remains of pesticides and packaging can not be destroyed in a manner that endangers the health of people and has a detrimental effect on the environment. The use of pesticides is a necessity in the process of cultivated plants. Production of some crops can not be imagined without the use of pesticides.

ECO-RULE IN THE TREATMENT OF PESTICIDE

The key to safe and effective use of pesticides:

- Ponder literature on the regularity and safety of use of pesticides
- Select the most appropriate pesticide for cultivated plants, diseases and pests which we suppress
- We take advice and consult the agro-experts

- When buying pesticides, you check the names and instructions for use
- Take all precautions during transport and storage of pesticides
- In situations akcidentnim disciplined, calm and proper
- Never eat or give animals food contaminated with pesticides
- Keep pesticides in a cool, dry and dark place
- Pesticides kept locked, and deny access to unauthorized persons and children
- Check that the recommended dosage and dilution of the concentration corresponding to those on packaging labels
- Do not make any concentrated or the recommended solution.
- - Never pour pesticides with their bare hands, and when handling use protective equipment
- - When filling pesticide sprayer take position against the wind
- - Watch where we leave the remaining pesticides
- - Do not use empty pesticide containers to hold the food and drinks
- - Destroy empty containers according to instructions proisanim
- - To apply pesticides in the early morning after a nice time, preferably when the wind slab
- - When applying pesticides do not take food and do not smoke
- - Equipment for the application, such as sprinklers, wash well with water immediately after use

- - Never throw the remaining pesticides in river or pond
- - The work required to shower after work to wash work clothes
- - Restrict long continuous operation by the heat
- - In case of health problems consult specialist Medicine
- - So, if, instead of natural, chemical products used in the garden, orchard, or garden plot in the field, strictly instructions and to eco-safety and environmental concerns

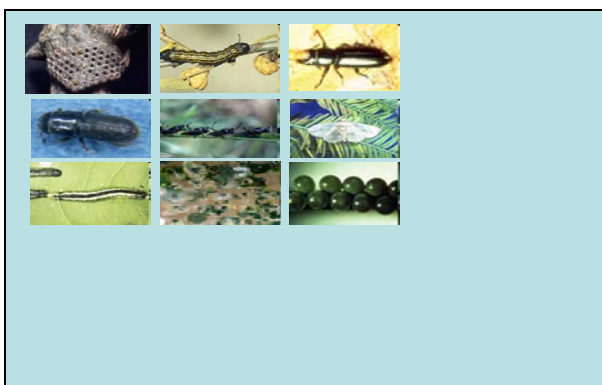


Figure 5. For suppression of plant pests

ENVIRONMENTAL BEHAVIOR

Several categories of environmental behavior are included in the summaries which precede each chemical presented in the Region-8 Label Book.

Information includes: Mode of action, Selectivity, Soil activity and mobility, Persistence and breakdown, Toxicity to humans and wildlife, Application timing, Weaknesses or limitations.

Mode of Action: Herbicides (movement in the plant, contact, translocated, action in the plant, inhibit protein synthesis, photosynthesis, or growth).

Mode of Action: Contact Herbicide

One which causes injury to only the plant tissue to which it is applied, or one which is not appreciably translocated within a plant.

Mode of Action: Translocated Herbicide

One which is moved within a plant from the point of application to the point of action; may be either phloem-mobile or xylem-mobile.

The term is often mis-restricted to mean a foliar applied herbicide which moves downward from the leaves to the roots.

Mode of Action: Animal Poisons-Insecticides (contact poison, systemic poison, attractants, pheromones, baits, repellants).

Mode of Action: Contact Insecticide

Pesticide which causes injury or death of insect through the touch rather than through inhalation or ingestion.

Mode of Action: Systemic Insecticide

Pesticide which is moved within a plant from the point of application to the point where the insect will contact or ingest it .

Mode of Action: Attractants

Pesticide which lures animals to a predetermined spot.

- Pheromones are biochemicals either released by the animal or synthesized which are sex attractants;

- Baits are chemicals which entice animals for reasons other than sex (smells like food...).

Mode of Action: Repellants

Pesticide which discourages animals from coming to a specific area

- Many chemicals unrelated to sexual activity (due to smell or other physical characteristic) are repellant to animals;

- Pheromones in low concentration are attractive to animals but, often, in high concentration become repellant.

Mode of Action: Selectivity

- Many products express a degree of selectivity

- Extremely variable from product to product

- Biologicals often more selective than chemicals

- Despite claims, selectivity is generally limited

- Often based on rate

- Many newer products are more selective

- Application method also influences selectivity

Soil Active Herbicide: applied to or present in the soil, these chemicals are readily absorbed by plant roots and subsequently negatively affects the plant in some manner.

Non Soil Active Herbicide: applied to or present in the soil, these chemicals are bound to soil particles or organic matter and are essentially unavailable to affect plants.

Soil Mobility:

- A major contributor to offsite movement;
- Leaching vs. lateral movement;
- Affected by the soil's;
- Sand content;
- Clay content;
- Organic matter content;
- Affects chemical half-life but not the degradation.

CONCLUSION

A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. A pesticide may be a chemical substance, biological agent (such as a virus or bacterium), antimicrobial, disinfectant or device used against any pest. Pests include insects, plant pathogens, weeds, molluscs, birds, mammals, fish, nematodes (roundworms), and microbes that destroy property, spread disease or are a vector for disease or cause a nuisance. Although there are benefits to the use of pesticides, there are also drawbacks, such as potential toxicity to humans and other animals. In the process of production of pesticides is necessary to organize and carry out the prescribed safety measures and adequate chemical protection. In addition to trained personnel and modern technology, it is necessary hermetization production process, quality filter ventilation and use of funds for personal and collective chemical protection. Protection measures and actions must always be present, along with previous and periodic medical examination and monitoring of health workers. With pesticides should not be working minors, pregnant women, nursing mothers, and persons who work with toxic chemicals contraindicated for the state of health.

Workers who handle pesticides, or to apply, must undergo an annual medical examination at the beginning of each agricultural season. In this regard, using results, should continue research and training staff.

If you are trying to find out how to safely and legally store and dispose of pesticides, this

guidance is for you; particularly; this is for household consumers, farmers, manufacturing/importing registrants and international interests.

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