REPUBLIC OF TAJIKISTAN

STRENGTHENING RESILIENCE OF THE AGRICULTURE SECTOR PROJECT IN TAJIKISTAN

МД РССК
SI AED

The technical solutions adopted in the project comply with the requirements of environmental, sanitary-hygienic, fire-prevention and other standards in force on the territory of the Republic of Tajikistan.

Dushanbe- 2022

Abbreviations and conventions

B – briquettes

VG, VRG - water-soluble granules

VGS- water-glycol solution

WDG - water-dispersible granules

VC, VSC - water-soluble concentrate

ASC - aqueous suspension concentrate

AS - aqueous solution

WSCAP - water-soluble capsules

WSP - water soluble powder

WS - water suspension

WSC - water-suspension concentrate

WAS - water-alcohol solution

ADW - air-dry weight

WE - water emulsion

G – granules

GS- glycol solution

D – dispenser

AS - active substance

L – liquid

CSC- colloidal solution concentrate

MC - microemulsion concentrate

NC - nanoemulsion concentrate

COLS - colloidal solution

CRP - crystalline powder

SC - suspension concentrate

EC - emulsion concentrate

SB - soft briquettes

MG – microgranules

OD - oil dispersion

OC - oil concentrate

MCS - microencapsulated suspension

EOC - emulsion oil concentrate

MOS - mineral oil suspension

MOE - mineral oil emulsion

OS - oil suspension

OSC - oil-suspension concentrate

ME – microemulsion

P – powder

BT – bait

PS – paste

FFFP - film-forming fluid paste

S – solution

SC - soluble concentrate

SP - soluble powder

SC - suspension concentrate

OS-C - oil suspension concentrate

WP - wettable powder

DFS - dry fluid suspension

DP - dry powder

SE - suspension emulsion

TAB – tablets

HB - hard briquettes

FSC - Fluid Suspension Concentrate

FP - fluid paste

FS - fluid suspension

ULV - ultra-low volume spraying

FLO - suspension concentrate

EMW - oil-water emulsion

Introduction

This material discusses certain areas of environmental protection, based on the possible impact of chemicals during importation, storage and use for pest control of agricultural crops on the environment.

The materials are developed for the purpose of ecological substantiation of technological and technical solutions for the use of these substances for economic needs, the rational use of natural resources and their restoration.

When developing this section, the requirements of environmental legislation and regulatory and methodological documents regulating the conduct of environmental impact assessment during the development of the "Environmental Protection" section, as well as during the period of use of chemicals, were considered.

Population growth and the intensification of agriculture have led to increasing environmental pollution with ecotoxins. A huge mass of toxic substances enter the atmosphere, soil and water sources, causing a negative impact on the soil, plants, animals and humans. The growth of biosphere pollution and the migration of toxic substances is often accompanied by the contamination of feed for farm animals and human food.

The uncontrolled use of chemical and biological substances is becoming very dangerous for the environment and human health. In this regard, the problem of cultivation and production of environmentally friendly crop and livestock products, respect for the environment is greatly exacerbated.

The protection of the environment from direct pollution and destruction, the introduction of low-waste technological systems and processes, the introduction of farming systems, the optimization of the landscape of agricultural areas, etc. depend on the environmental literacy of specialists. The effectiveness of environmental protection measures in agriculture depends on the environmental foresight of specialists, their ability to link issues of production development with environmental objectives.

1.General part

This act of environmental impact assessment during the import, storage and use of chemicals for pest control of agricultural crops was made as part of the project "Import, storage and use of the following chemicals for pest control of agricultural crops" in accordance with the requirements of SNiP 11-01-95 and manuals to SNiP 11-01-95 on the development of the section "Environmental Protection": (Karatee) Active ingredient: lambda-cyhalothrin drug form: k.e. (emulsion concentrate -5%) in the amount of 5000l, (Nurel-D) Active ingredient: 500 g / l chlorpyrifos and 50 g / l cypermitrin, form of the drug: k.e. (emulsion concentrate - 55%) in the amount of -5000l, (Fostak) Active ingredient Alpha - cypermethrin, drug form: k.e. (emulsion concentrate -10%.) in quantity - 5000l.

2. Information about the object

LLC (Limited Liability Company) "---------" as an entrepreneurial organization is also engaged in the import of various chemicals used in the Republic of Tajikistan for pest control. At the moment, LLC "------" imports the above-mentioned chemicals for the destruction of pests of agricultural crops. For the implementation of this project, LLC "------" has the

appropriate technical and other capabilities, including a warehouse for the storage of pesticides that meet the regulatory requirements in this area.

3. Technology of use

Karate-insectoacaricides, active ingredient: 50 g/l lambda-cyhalothrin, chemical class, pyrethroids hazard class: 2, formulation: Ph.D. (emulsion concentrate), a pyrethroid insecticide for protecting crops from a complex of pests, including mites, as well as for disinsection of granaries and adjacent areas.

Advantages;

- Protection of a wide range of crops from major pests.
- Effective against a wide range of pests, has a strong acaricidal effect.
-Biological efficiency coupled with low hectare costs provide high economic returns.
-Pronounced "knockdown" effect, prevention of crop losses.
-Absence of phytotoxicity for culture and negative impact on the environment.
-Possesses contact, intestinal, residual and repellent action.
•Ease and simplicity of application.

Nurel-D-Insecticide of contact action; active ingredient: mixture of chlorpyrifos and cypermethrin, mixed group (organophosphorus + pyrethroids), formulation: 55% emulsion concentrate

Mechanism of action

Synthetic pyrethroid. It has a contact, intestinal, fumigant, local systemic and repellent action. The drug is very quickly absorbed by plants. If it rains after 2 hours, the processing efficiency does not decrease. It penetrates into plant tissues, but does not spread throughout the plant. If after treatment the weather is hot and the air temperature reaches above 200C, then Nurella-D vapors destroy secretly living and hidden insects.

Application features

Apply during the growing season when a vulnerable stage of the pest appears on the crop. It is allowed to carry out manual work in the fields 10 days after processing, and mechanized work - after 4 days. The drug can be applied by any type of sprayer. The drug can be mixed with most insecticides and fungicides, except for those drugs that have an alkaline reaction. Do not mix with copper-containing compounds (copper sulfate, Bordeaux mixture).

Fastak-active ingredient Alpha - cypermethrin consumption rate characteristics: 0.1-0.36, appointment; Contact-intestinal insecticide designed to control a wide range of insect pests. Advantages; quick death of the pest; Highly effective against most insect pests;

Resistant to washing off by atmospheric precipitation; Repellent effect on pests; Not phytotoxic at recommended doses. Mechanism of action Alpha-cypermethrin has a multilateral effect on harmful insects, showing intestinal activity, which ensures the death of the pest when fed on treated parts of the plant; contact activity - due to the drug getting on the integument of the insect during processing; repellent effect is that insects avoid feeding on plants treated with Fastak. Active ingredient Alpha-cypermethrin (100 g/l). Preparative form emulsion concentrate (EC), chemical class, pyrethroids, methods of application spraying during the growing season. To achieve maximum effectiveness of the insecticide, spray with Fastak when the pest first populates.

4. Insecticides and the environment

Pesticides - pesticides; a broad class of chemicals used to control weeds (herbicides), insects (insecticides), fungi (fungicides), and bacterial (bactericides) diseases.

Soil primarily acts as a sink for pesticides, where they degrade and are constantly transported to plants or the environment, or as a storage where some of them may exist many years after application. The movement of pesticides in the soil occurs with soil solution: during surface runoff caused by precipitation or irrigation, pesticides move in solution or suspension, accumulating in soil depressions. This form of movement of pesticides depends on the terrain, soil erosion, precipitation intensity, the degree of soil cover with vegetation, the period of time that has passed since the pesticide was applied. The amount of pesticides moving with surface runoff is more than 5% of that applied to the soil.

Cultivated lands are the result of complex natural processes and centuries of human labor. Therefore, the quality of soils depends on the duration of cultivation of the land and the culture of agriculture. Together with the harvest, a person removes mineral and organic substances from the soil, thereby impoverishing it. Therefore, it became necessary to replenish the reserves of these substances by introducing fertilizers into the soil. But at the same time, one should remember about rationalism. By fertilizing and cultivating the soil, observing the sequence of crops in crop rotations, a person can increase the fertility of the soil to such an extent that most cultivated soils have become artificial, i.e. created with the participation of man. Thus, in some cases, human impact on the soil can lead to an increase in its fertility, in others - to deterioration, degradation and death.

The intensification of agriculture, the wide scope of reclamation construction and the chemicalization of agricultural land in order to steadily increase the country's food stock require a particularly careful and careful attitude to the soil as a means of production and living conditions. The protection of soils and their rational use are of paramount importance for the economic and social development of the country. The significance of the current state of soil resources, their rational use, careful attitude to them will serve to increase their fertility.

The effect of insecticides on plants and biocenoses

Insecticides that have penetrated into plants lead to their suppressive, damaging or, conversely, stimulating effect on the general condition, growth and development. If the drugs are used in moderate doses under optimal temperature conditions, the absence of moisture deficiency and a sufficient amount of nutrients available to plants, this causes a stimulating effect of the insecticide on protected plants, their growth, development and accumulation of valuable components. The most significant effect is observed when insecticides are used during the period of intensive plant growth.

The use of chemicals in high dosages leads to profound changes in metabolism. At a certain level of pesticide exposure, plants cannot overcome the violations of physiological functions, and irreversible processes occur that adversely affect growth and development, and sometimes lead to their death.

- When entering the biocenosis, insecticides interact with almost all plants, insects, microflora, and amphibians. In the process of integration and advancement along trophic routes, chemicals enter water bodies and accumulate in animals and birds
- One of the components of the biocenosis, the soil microflora, is very sensitive to the effects of pesticides. Most pesticides applied in optimal doses do not cause sharp and long-term disturbances in the composition of soil microflora. They have the strongest toxic effect in the first period after application. After 6-10 weeks after treatment, the microflora is restored.
- Another vulnerable part of the biocenosis is beneficial entomophagous insects, on which insecticides have a direct or indirect effect (for example, when feeding on dead insects). Insecticides have a negative effect on pollinating insects: bees, bumblebees, butterflies.
- The third component of the biocenosis - water bodies and their inhabitants - also experience the negative impact of chemicals. Small concentrations of toxicants stimulate the vital functions of plankton, higher concentrations inhibit them, and even higher ones lead to death. At the same time, algae act as a detoxifying factor for pesticide residues, accumulating them in their cells.

For biocenoses, a wide spectrum of action of insecticides is especially dangerous, under the complex influence of which changes in the population composition occur in the direction of degradation, reduction. This simplifies the genetic structure of not only individual species, but also cenoses as a whole.

Impact on non-target species.

Some insecticides kill or harm creatures other than those they are intended for. For example, birds can become poisoned by eating food that has recently been sprayed with insecticides, or by mistaking an insecticide pellet on the ground for something edible.

The sprayed insecticide can drift from the area in which it is used into wilderness areas, especially when sprayed from aircraft.

Harm to bees

Insecticides can kill bees that pollinate plants and cause colony collapse syndrome, in which worker bees suddenly disappear. The loss of pollinators means a decrease in the yield of honey plants. Sub-lethal doses of some insecticides (eg imidacloprid and other neonicotinoids) affect beekeeping.

5. Pesticide formulations

1. Wetting powders (w.p.) - powdered pesticides containing the active substance (a.s.), fillers and surface-active substances (surfactants). When diluted with water, stable suspensions are formed. S.F. meet the following requirements: stable during storage and do not cake; when diluted with water, they quickly form suspensions; well moisten the leaves of plants and other treated surfaces and are held on them for a long time.

2. Emulsion concentrates (e.c.) - liquid or pasty pesticides containing a.s (active substance), solvent, emulsifier (soap) and wetting agent. When diluted with water, e. form stable emulsions.

3. Aqueous solutions (a.s.). - pesticides with good solubility in water. Aqueous solutions are inconvenient for storage and transportation, evaporate, freeze in cold weather. They do not moisten the leaves well, because they quickly roll off the treated surface.

4. Granular preparations (g.) - granules consisting of a.i. and filler. The granules do not cause plant burns, do not infect entomophages, during application there is no drift from the treated surface, the danger to humans, animals, and the environment is reduced.

5. Suspension concentrates (c. s.) - a liquid consisting of the active substance of the pesticide dissolved in water or a solvent. When mixed with water, they form suspensions.

6. Mineral oil emulsions (m.e.) are concentrated emulsions consisting of two phases (small drops of oil with a pesticide dissolved in them and water).

7. Dry fluid suspension (d.f.s.) - microgranular a.i. with surfactant. Unlike wettable powders, it does not generate dust. When mixed with water, it forms a stable suspension.

8. Technical preparation (tech.) - a.s. with the inclusion of impurities.

9. Tablets (tab.) - compressed a.s. with a neutral filler or baiting agent in the form of tablets.

10. Granular baits (g.pr.) consist of a.s. and bait food. Available in the form of granules.

11. Soluble powders (r.p.) and water-soluble concentrates (w.c.) - water-soluble a.s. pesticide with the addition of surfactants. Unlike s. etc. they do not contain filler.

12. Preparation for aerosols. Aerosols are particles of a pesticide suspended in the air. Drop (liquid) aerosols (fogs) are obtained using special aerosol generators. Solid aerosols (fumes) are obtained by burning special smoke bombs containing pesticides.

6. Methods of application of pesticides

Spraying - the most versatile way to apply pesticides. Advantages: uniform distribution of the active substance and good coverage of the treated objects at low consumption rates per unit area; good retention of pesticides when wetting agents and adhesives are added to the working solutions; slight dependence on meteorological conditions. Disadvantages: the complexity of the preparation of working solutions and compliance with the specified rate of consumption of liquid and preparation; equipment corrosion; high fluid flow.

Seed dressing - seed treatment before sowing with pesticides. There are etching with moisture, semi-dry, wet, dry. Currently, etching is carried out with film-forming compounds. As film formers, 5% w.s. polyvinyl alcohol (PVA) and 2 -2.5% w.s. sodium salt of carboxymethyl cellulose (NaCMC).

Fumigation - the introduction of a pesticide into the habitat of a pest in the form of vapor or gas. The main types of fumigation work: fumigation of premises, chamber and tent fumigation, fumigation of greenhouses and soil. The effectiveness of fumigators depends on the air temperature. Disadvantages: cause corrosion of metals, flammable and explosive, reduce the germination of seeds and planting material.

Poisoned baits - the use of pesticides together with bait material: cereal grains, cereals, flour, etc. Wet, semi-dry and dry poisoned baits are used. In the first case, the bait material is

impregnated with a solution or suspension of a pesticide. Semi-dry poisoned baits are slightly dried. Dry is prepared by mixing the components. Adhesives are added to the baits - mineral oil, paste, etc.

7. Classification of pesticides

Depending on the purpose, chemical nature, degree of impact on the body of warm-blooded animals and humans, several classifications of pesticides are distinguished: industrial, sanitary - hygienic, chemical and ecotoxicological.

7.1 Production classification

Production classification is based on the ability of pesticides to destroy certain groups of harmful objects.

Depending on the objects of application, the following groups of pesticides are distinguished:

- acaricides - to combat herbivorous mites;
- algicides - for the destruction of algae and other weeds in water bodies;
- arboricides - for the destruction of unwanted tree and shrub vegetation;
- aphicides - to combat aphids;
- bactericides - to combat pathogens of bacterial plant diseases;
- fungicides - to combat pathogens of fungal diseases of plants;
- herbicides - to control weeds;
- zoocides (rodenticides) - for rodent control;
- insecticides - to combat harmful insects;
- insectoacaricides - to combat harmful insects and mites;
- larvicides - for the destruction of larvae and caterpillars of insects;
- molluscicides - to fight slugs;
- nematocides - to combat roundworms (nematodes);
- ovicides - for the destruction of eggs of harmful insects and mites;
- seed disinfectants - for pre-sowing treatment of seeds;
- fumigants - substances used in a vapor or gaseous state to destroy pests and pathogens of plants.

Depending on the area of use, pesticides are divided into the following groups:

- antiresistants - special additives that reduce the resistance of insects to certain substances;
- attractants - substances to attract insects;
- hematocides - substances that cause sterility of weeds;
- desiccants - preparations for pre-harvest drying of plants;
- defoliants - preparations for removing leaves;
- plant growth regulators - substances that affect the growth and development of plants;
- repellents - to scare away harmful insects;
- retardants - to inhibit plant growth;
- synergists - additives that cause an increase in the action of pesticides;
- pheromones - substances produced by insects in order to attract individuals of the opposite sex;
- chemosterilants - substances used for sexual sterilization of insects.

7.2 Classification of pesticides according to the method of penetration into the body of the pest, the nature and mechanism of action Insecticides are divided into 4 groups:

- contact, causing the death of insects upon contact with any part of their body;
- intestinal, causing poisoning of pests when the poison enters the intestines with food;
- systemic, able to move through the vascular system of the plant and poison the insects that eat it;
- fumigants acting on insects in a vapor or gaseous state through the respiratory system.

Fungicides according to the nature of the action on pathogens and the method of penetration into plants are divided into 2 groups:

- protective (preventive);
- treating (fighter).

Protective fungicides prevent infection of plants by phytopathogens, but are not able to cure diseased plants. They can be contact or systemic action.

Protective contact fungicides do not penetrate into the plant, but remain on its surface and act on the pathogen in direct contact with it.

Protective systemic fungicides penetrate the plant and prevent damage to parts far from where the fungicide is applied.

Curing fungicides are substances capable of destroying phytopathogens that have already invaded plant tissues. Like protective ones, they are divided into contact and systemic ones.

Healing contact fungicides are not able to move around the plant, as they have only a local (local) penetrating effect.

Curing systemic fungicides penetrate the plant and move from the roots to the stem and leaves and destroy phytopathogens that have already invaded plant tissues.

Herbicides according to the nature of the action on plants are divided into 2 groups:

- selective (selective), destroying only one plant species (weeds) and relatively safe for other (cultivated) species;
- general extermination (solid action), destroying all vegetation.

The division of herbicides into selective and general exterminators is conditional, since the selectivity of preparations is maintained only within certain consumption rates, terms and methods of application.

7.3 Sanitary and hygienic classification

The sanitary and hygienic classification of pesticides is based on the degree of their toxicity to biological objects, cumulative properties, degree of volatility and persistence in the soil, taking into account the possibility of circulation in the external environment.

One of the most important sanitary and hygienic requirements for pesticides is lower acute and especially chronic toxicity for warm-blooded animals and humans.

Acute toxicity of a substance is characterized by a lethal dose of LD50 - the average dose of a substance in milligrams per 1 kg of live weight, which causes the death of 50% of experimental animals. Depending on the lethal dose, the degree of toxicity of chemicals is assessed.

1.According to the degree of impact on the body when administered into the stomach, pesticides are divided into four hazard classes:Сильнодействующие ядовитые вещества $ЛД_{50}$ – менее 50 мг/кг;

2. Highly toxic - LD50 from 51 to 200 mg/kg;

3.Moderately toxic - LD50 from 201 to 1000 mg/kg;

4.Low toxicity - LD50 more than 1000 mg/kg.

Toxicity upon admission through the skin (skin-resorptive) is divided into:

1. Pronounced (LD50 less than 300 mg/kg);

2.Expressed (LD50 301 -1000 mg/kg);

3. Mild (LD50 over 1000 mg/kg).

According to the degree of volatility, pesticides are divided into:

Very hazardous substance (saturating concentration is greater than or equal to toxic);

1. Hazardous substance (saturating concentration is greater than the threshold);

2. Low-hazard substance (saturating concentration does not have a threshold effect).

According to the ability to accumulate (accumulation in the body as a result of incomplete detoxification and excretion from the body), there are:

1. Substances with supercumulation (Ccum. < 1);

2. Substances with pronounced cumulation (Ccum. 1 - 3);

3. Substances with moderate cumulation (Kcum. 3 - 5);

4. Substances with mild cumulation (Ccum.> 5).

The cumulation coefficient (Kcum) characterizes the amount of cumulation and is determined by the ratio of the median lethal dose of a substance with repeated administration to the median lethal dose of a single use:

Kkum. = LD50 in chronic trial/LD50 in acute trial

The lower the cumulation coefficient, the more pronounced the cumulative effect of the drug.

According to stability in the soil (persistence) pesticides are divided into:

1.Very persistent (period of decomposition to non-toxic components over 2 years);

2 . Persistent (decomposition time from six months to 2 years);

3. Moderately persistent (decomposition time from 1 to 6 months);

4. Low resistance (decomposition time up to 1 month).

In addition to the main criteria listed above, which make it possible to give a hygienic assessment of pesticides, other pathological effects of their action on the body are also taken into account, such as blastomogenicity, mutagenicity, teratogenicity, and embryotropism.

Blastomogenicity characterizes the ability of a substance to cause the formation of tumors. If the tumor is malignant, the drug is classified as carcinogenic. Distinguish:

- clear carcinogens (cause cancer in humans);
- carcinogens (cause tumors in animals, the effect on humans has not been established);
- Weak carcinogens (isolated cases of tumor formation in animals).

Mutagenicity pesticides is characterized by the frequency of manifestation of mutations in plants, animals and fruit flies. On this basis, distinguish:

- supermutagens (substances that cause 100% of mutations in plants and animals; 100 mutations on 100 chromosomes are taken as 100%);
- strong mutagens (substances that cause 5-10% of mutations);

- medium mutagens (2 - 5% of mutations);
- Weak mutagens (1-2% mutations);
- very weak mutagens (0.5 - 1% of mutations).

Teratogenicity - the ability of pesticides to cause deformities in offspring. Distinguish:

- obvious teratogens (drugs that cause deformities in humans);
- potential teratogens (drugs that cause deformities in experimental animals).

Embryotropism – - the property of pesticides to disrupt the normal development of the embryo. Distinguish:

- selective embryotropism (characterized by the absence of toxicity to the maternal organism);
- moderate embryotropism (manifested in the presence of other toxic effects).

7.4 Chemical classification

The chemical classification is based on the chemical composition of pesticides.

Depending on the chemical structure, fungicides are divided into inorganic and organic.

Inorganic fungicides include compounds of copper and sulfur (Bordeaux liquid, copper sulfate, copper oxychloride, ground and colloidal sulfur).

Organic fungicides are representatives of different classes of chemical compounds:

- aldehydes (formaldehydes),
- nitrophenols (nitrafen),
- derivatives of 2,6 - dimethylphenylalanine (ridomil),
- dithiocarbamic acid derivatives (zineb, polycarbacin, TMTD),
- thiourea derivatives (topsin M),
- derivatives of heterocyclic compounds (bayleton, baytan, vitavax).

Herbicides are classified as organic compounds from various classes:

- derivatives of aliphatic carboxylic acids (dual, ramrod, THAN),
- aromatic amines (stomp, treflan),
- derivatives of amino acids (group 2,4 - D and 2M - 4X),
- derivatives of carbamic and thiocarbamic acids (betanal, triallat),
- urea derivatives (clay, dozaneks),
- triazine derivatives (atrazine, prometrin, semeron, sitrine, simazine),
- heterocyclic compounds (lontrel, reglone, bazagran, venzar).

Insecticides have a diverse chemical nature and have a different mode of action:

- organophosphorus compounds (actellik, wolaton, metaphos, karbofos, phosphamide),
- carbamates (sevin, pyrimor, kroneton),
- synthetic pyrethroids (decis, sumicidin, karate, cymbush).

7.5 Ecotoxicological classification of pesticides

Table 1 - Rating scale for pesticide hazard levels

Ecological and toxicological	**Hazard Class**	**Options class**	**Evaluation score**

and hygiene indicators			
1	2	3	4
Persistence in soil	1 2 3 4	Up to 1 month 1-6 months 0.5-2 years > 2 years	2 4 6 8
Action on soil enzymatic processes and biota	1 2 3	Does not affect Acts on single processes and populations Affects multiple processes and populations	0 1 2
Migration along the soil profile	1 2 3 4	Doesn't migrate Migrates up to 15 cm Migrates up to 50 cm Migrates > 50cm	0 1 2 3
Translocation to cultivated plants	1 2 3 4	Does not enter plants Acts, but does not negatively affect Enters crop products Shows phytotoxic effect	0 1 2 3
Reaction to insolation	1 2	Subject to photochemical degradation Not affected	0 1
Effect on organoleptic qualities for crop products	1 2 3 4 5	>1 mg/kg 1-0.1 mg/kg 0.1-0.01 mg/kg <0.01 mg/kg 0	0 1 2 3 4
Maximum allowable concentration for water in reservoirs	1 2 3 4 5	>1 mg/kg 1-0.1 mg/kg 0.1-0.01 mg/kg <0.01 mg/kg 0	0 1 2 3 4
Threshold concentration for drinking water	1 2 3	>0.1 mg/kg 0.1-0.01 mg/kg 0.01-0.001 mg/kg	0 1 2

Effect on the organoleptic qualities of crop products	1 2	Does not worsen worsens	0 1
Volatility	1 2 3 4	non-volatile substance Saturating concentration below threshold The saturating concentration is equal to the threshold Saturating concentration is equal to toxic	0 1 2 3
toxicity to warm-blooded animals (LD50)	1 2 3 4	>1000 mg/kg 201-1000 mg/kg 51-200 mg/kg <50 mg/kg	1 2 3 4
The coefficient of cumulation in the body of warm-blooded	1 2 3 4	>5 3-5 1-3 <1	0 1 2 3

The danger of pesticides as environmental pollutants is determined mainly by their behavior on the territory of agricultural land, where they are used and from where they can migrate. Therefore, the ecotoxicological assessment of individual preparations should primarily be based on data on the dynamics of their content in soil and plants. In addition to the potential for circulation in the biosphere, it is necessary to take into account toxicity and other properties that determine a greater or lesser threat of a detrimental effect on beneficial fauna and flora of terrestrial and aquatic ecosystems, as well as the risk of food contamination.

Due to the fact that even substances close in chemical composition often differ significantly in environmental and hygienic indicators, when choosing pesticides, it is necessary to take into account the specific properties of each preparation.

8. assessment of the ecological - hygienic situation in quantitative parameters

When planning measures for the protection of the environment and crop products from pesticide pesticide, the potential danger of the spread and accumulation of toxic substances in the territory of zones, areas, farms or even individual crop rotation should be taken into account, which is determined by the scale of the task. To characterize the ecotoxicological situation using numerical parameters, a technique developed by M.S. Sokolov and M.A. can be used Glazovskaya with some additions.

Assessment of the level of danger created by the use of pesticides in this territory is carried out according to the following indicators: adjusted evaluative index for individual

drugs, the average assortment of the pesticides used, the load of pesticides per unit land area and the adjusted self -cleaning ability of the territory.

It is advisable to use the adjusted evaluative index only for insecticides. It serves in order to determine which of the drugs used in the area or economy of the assortment is the greatest environmental danger and should be primarily taken into account when monitoring the level of its residues in the soil and crop products. Calculated by the formula:

$Iaa = (K_i + 1) * B_0$

Where is the lawsuit. - Index adjusted assessment;

Ki is the coefficient of use of the pesticide;

B0 is an estimated pesticide score.

The coefficient of the use of pesticides (ki) is a relative share of each drug in the total volume of the entire assortment of pesticides. To calculate it, the area treated with a separate pesticide (S) is divided into the total area of the use of pesticides (S0):

$K_i = S/S_0$

The average estimated index (Iae) characterizes the average level of danger of the used assortment of pesticides in this territory and is a weighted average of the assessment points of each drug. For its calculation, the sum of the works of the coefficient of use of each pesticide for its evaluative score is determined:

$Iae = \sum K_i * B_0$

The value of the load of pesticides to the territory is determined by a conditional dose per unit of the total land area of the district and per unit of arable area, including pesticides of pesticides (gardens, vineyards).

The conditional dose (Cd) is calculated by dividing the total number of pesticides used in drug forms into the total number of hectares of agricultural land. Calculations are carried out according to drug forms, and not according to the active substance, since many ingredients, in particular, synthetic surface substances, are characterized by a pronounced biological effect.

To determine the degree of danger of pollution of natural landscapes, a conditional dose of pesticides for the entire land territory of the district is calculated. The lower the value of this dose in relation to the dose of agricultural land, the less the threat of pesticides of natural ecosystems with pesticides and the more likelihood of their rapid self -cleaning.

For an objective assessment of the ecotoxicological situation in various areas, it is necessary to take into account such a parameter as the ability of the territory to self -cleaning. The self -cleaning ability of a particular territory can be expressed by an average quantitative indicator - a adjusted index (Iaqa), representing a weighted average evaluative score for a given region. Distinguish the following indices of the ability to self -cleaning: very intense > 0.8; intensive 0.8 - 0.6; moderate 0.6 - 0.4; weak 0.4 - 0.2; Very weak <0.2.

For a comparative assessment of the ecotoxicological situation in different areas, an integral ecotoxicological index (IET_{in}) is used, taking into account the above parameters:

$IET_{in} = Iae * Cd / Iaa$

The low -hazardous situation is characterized by an index of less than 50, medium hazardous - from 50 to 150 and dangerous - more than 150. If necessary, chemical protection of plants requires increased measures for sanitary and environmental control.

9. Features of the effects of pesticides on the environment compared to other toxicants

1) *The inappropriation of their circulation in the biosphere, i.e. When entering, the pesticide immediately enters the environment and is there until complete decay. The duration of the circulation of various substances is not the same and depends on their chemical composition.*

2) *the biological activity of drugs, i.e. Pesticides initially laid down a potential danger to nature and man.*

3) *the impossibility of reducing pesticide consumption rates, because because decrease in norms leads to the emergence of harmful objects and a decrease in the effectiveness of protective measures.*

4) *Contact of pesticides with a large number of people, which is associated with the use of drugs in various sectors of agriculture, their circulation in the external environment and the availability of residues in food products.*

5) *the resistance of the drugs in natural conditions and their transmission through food chains (HOS is more persistent, PHOS less persistent)*

6) the possibility of accumulating pesticides in the body.

Depending on the characteristics of the pesticides, the forms of their action in the biosphere are established:

1) local action

- directly to harmful organisms;
- Side of other organisms, soil, water.

The effectiveness of the local action of pesticides is determined by the shape, dose, methods of use, selectivity of action and the speed of decay.

2) The closest aircraft (landscape - regional)

By the duration and nature of the impact, it is different depending on the relief, soil and climatic conditions. The dry the climate, there is more salinity of soils, higher the level of groundwater, the greater the likelihood of preserving and accumulating persistent pesticides in the soil, water, biomass.

3) Aperture of distant (regional - basin)

It is characteristic of persistent drugs that can migrate in river pools, according to their floodplains and terraces in the form of solutions, suspensions or in a sorbed state with soil colloids.

4) Aircraft is very distant (global)

It covers the planet in general and its individual components - the ocean, land, atmosphere. It is connected:

- with the transfer of air currents of long -lasting pesticides in the form of aerosols;
- currents, storms, cyclones;
- migration of birds, animals, humans;
- with the movement of transport and transportation of goods, raw materials, food;
- with the test of nuclear and other types of biological weapons and military operations.

This aircraft is manifested gradually and is weakened by factors such as insolation (destruction in the light), ultraviolet radiation, and atmospheric precipitation.

Side effects of pesticides on the environment

1. Development of the stability of harmful organisms to pesticides

Sustainability is the biological property of the body to resist the poisoning effect of the pesticide.

Distinguish between stability:

A) natural, which is divided into the following types:

- sexual (female individuals are more stable than male);
- age (larvae of the 1st age are more sensitive to the action of a pesticide than older larvae);
- phase (sustainable organisms in the phase of dolls and eggs, sensitive - larvae),
- seasonal (sensitive in the spring, stable in the fall).

B) acquired (resistance) - the ability of harmful organisms to survive and develop in the presence of a chemical substance, which previously suppressed their development.

2. The influence of pesticides on biocenoses

Manifests itself:

- in damage to cultivated plants;

- in changes in the composition of microflora;

- In the deaths of mammals, birds, fish, useful insects.

3.Accumulation of pesticides and transmission through power chains

The remains of pesticides in the environment can be absorbed by plants or animal organisms, which, in turn, are consumed by larger animals in which the concentration of pesticides increases. This leads to their accumulation in food and subsequent consumption by a person. Pesticide circulation can occur according to the following schemes:

1) air - soil - plants - herbivore - humans;

2) Soil - water - zooplankton - fish - man.

10. The behavior of pesticides in the air

The main source of pesticides in the air environment is the processing of seeds, agricultural and forest lands, and water bodies.

The receipt of pesticides in the air:

1) With fine dispersal spray, the drugs are adsorbed in the air with solid particles and are transferred by air streams. It was established that when pollinating the forest on the trees of the processed area, only 50 % of the pesticide is delayed, the rest of the amount is in the air for some time, and then settles on plants and soil at a considerable distance from the processing site. Especially a large demolition occurs when using high -flying drugs. The air is contaminated more during pollination than when spraying.

2) Pesticides enter the air environment with soil dust with wind erosion, when treating the soil, harvesting.

3)Pesticides can enter the atmosphere as a result of evaporation from the surface of the soil and plants.

The degree of air pollution with pesticides depends on:

- the physicochemical properties of the pesticide (the volatiles are more polluted than non-lethal ones);

- air temperatures (the higher the temperature, the stronger the degree of pollution; the temperature during chemicalbrots should not exceed 25 degrees);
- wind speeds (3-4 m/s- with ventilation spraying);
- the values of the processed area (the larger the area, the greater the degree of pollution);
- method of introduction (ground, aviation spraying).

The highest concentration of drugs in the air is marked by the middle of the day when the temperature is maximum, therefore, pesticide treatment is carried out in the early morning or evening hours.

Removing pesticides from the atmosphere occurs:

- *With precipitation,*
- *in the process of diffusion in the border layer,*
- *As a result of chemical destruction.*

The most important are chemical transformations in which less toxic products are obtained than the original pesticides. The chemical reactions of the destruction of pesticides include hydrolysis in water vapor and oxidation of air with oxygen. The degradation of pesticides as a result of hydrolysis and oxidation is accelerated under the influence of light.

11. The behavior of pesticides in water

Water serves as the main means of transport of pesticides in the environment.

Pesticides can fall into open pods:

- with the wastewater of enterprises that produce them;
- for aviation and ground treatment of agricultural vehicles and forests;
- with rain and meltwater;
- when treating open reservoirs with pesticides (from algae, mollusks, aquatic vegetation).

12. The influence of pesticides on aquatic ecosystems:

- change the organoleptic properties of water (taste, smell);
- reduce the content of oxygen soluble in water;
- change the chemical composition of water;
- destroy water insects;
- oppress the life of the inhabitants of aquatic ecosystems;
- are transmitted through the chains of food and kumulated in products.

In the transition of pesticides from water to other links of the biological chain, their content increases by hundreds and thousands of times. For example, upon receipt of chlorological preparations with rainwater flow into reservoirs in an amount of 3*10-1 mg/l, they were found in fish in a concentration of 1-7.5 mg/kg.

To assess the stability of pesticides in water, taking into account the danger for fish, you can use the following scale:

the expansion period up to 5 days is a small substance;

6-10 days-medium;

11-30 days-stable;

More than 30 days - highly stable.

13. The behavior of pesticides in the soil

The intake of pesticides in the soil:

1. Direct introduction to the soil for the destruction of soil -alien pests, pathogens, and weeds.
2. admission to the soil after processing the ground parts of plants as a result of demolition by the wind, washing off with sediments.

The receipt of pesticides in the soil in the form of residues contained in the leaves, roots, etc.

In the soil, pesticides can remain unchanged and maintain their toxicity for a certain time.

The property of pesticides to resist the decaying effect of physical, chemical and biological processes characterizes their resistance (persistence).

Persistence depends on:

- the physicochemical properties of the pesticide (Hosa- the expansion period of up to 18 months, Fosa- less than 3 months);
- doses and forms of the drug (granulated longer are preserved than dry powders and aqueous solutions);
- type of soil, its humidity, temperature and physical properties (in highly humused soils, drugs are more rack);
- the composition of soil microflora (some microorganisms can quickly destroy even the most persistent chemicals).

Movement of pesticides in the soil

Pesticides and their metabolites migrate through the soil profile in horizontal and vertical directions. This process occurs under the influence of:

- molecular diffusion with capillary moisture;
- descending current of gravitational water;
- root system of plants;
- movements during soil processing.

Decomposition of pesticides in the soil

Pesticides are modified or completely decomposed in the soil as a result:

Physico-chemical processes. Pesticides completely decompose in the soil as a result of their adsorption with soil colloids. The degree of adsorption depends on the content of humus in the soil (the more humus, the higher the adsorption); soil moisture (the more water absorbs colloids, the less free places for sorption of drugs); soil temperatures (the higher the temperature, the lower the adsorption);

• microbiological decomposition (the better the conditions for the development of soil microorganisms, the more intense the decomposition of pesticides is underway);

• absorption by higher plants. The absorption and removal of pesticides from the soil with plants depend on their species characteristics. Plants according to the degree of accumulation of pesticides in the productive organs are located in the following order: carrots> Potatoes> Beuters> Perennial herbs> Tomato> White cabbage. Chlorological pesticides accumulate mainly in the peel, to a lesser extent - in the tops and minimally - in the pulp of the root of the root of the root.

Detoxification of pesticides occurs due to adsorption by soil colloids.

The removal of drugs from the soil occurs as a result of disappearance, evaporation, movement outside the root layer, leaching.

14. The action of pesticides on biocenoses

14.1 The influence of pesticides on entomophages

In biocenosis, the initial groups are insects of phytophages that feed on plants. Their numbers regulate the entomophages. Entomophages are divided into predators and parasites. Predators eat the victim right away, for example, God's cow destroys aphids. Parasites are introduced into the body of the pest, causing death. For example, a fly - a gold -eyed lay eggs in the body of the pest (its larva). Entomofaga larvae formed from eggs feed on the contents of the pest larva (parasitized in it), causing death.

In agrobiocenosis, a change in the species composition of phytophages and entomophages occurs:

Firstly, species that are not able to eat cultivated plants are sharply suppressed and tolerate the conditions for their cultivation;

Secondly, species feeding on cultivated plants, rapidly multiply and become dangerous pests;

Thirdly, the effectiveness of many entomophages is reduced in agricultural focus, because They exist due to several close species of insects.

Thus, agribiocenoses are characterized by frequent outbreaks of mass propagation of pests, for the destruction of which insecticides are used. Insecticides are detrimental to useful insects. It was established that from 2 hectares of potato field there are from 2 to 3.5 thousand useful flies of sirfid, from 2.5 to 5 thousand beetles, up to 200 thousand predatory spiders. And all these useful insects are almost completely dies in chemical treatment against the Colorado beetle. The death of useful insects is most noticeable when using insecticides in forests and gardens, because Here, these insects are represented by a large number of species and play an important role in regulating the number of pest population. The death of entomophages contributes to the propagation of pests. For example, spraying fruit trees with sulfur preparations causes the death of tiflodromide, as a result of which mass reproduction of spider mites occurs.

Ways to prevent mass propagation of pests after the use of pesticides and preserve entomophages

1. Chemical treatments should be carried out only after a thorough examination of crops for populism by pests, taking into account the economic thresholds of harmfulness (ETH);
2. Himobotes should be carried out in a period when the entomophages are in a inactive state or in places inaccessible to contact with pesticides. For example, the early nesting processing of the garden destroy pests wintering on plants, but at the same time do not destroy the entomophages located at this time in the soil;
3. Conducting selective processing. For example, regional processing of flax crops against flax fleas, because settlement begins with the edges of the field;
4. The use of selective insecticides, which, causing the death of pests, do not destroy their natural enemies - entomophages;

The choice of methods for making insecticides. For example, the use of granular drugs is safer than pollination and spraying.

The influence of pesticides on protected plants

Pesticides can have a stimulating or phytotoxic effect on plants.Стимулирующее действие проявляется:

5- in improving the germination of seeds;
6. - in an increase in the accumulation of dry matter;
7. - in increasing growth energy;
8. - in raising the crop;
9. - In improving product quality.
10. The stimulating effect can be:
11. - direct (with the direct effect of a pesticide on the metabolism of a cultural plant);
12. - indirect (in connection with the destruction of harmful organisms that prevent the normal development of plants).
13. 2. Phytotoxic action
14. The ability of pesticides to exert toxic effects on the plant is called phytotoxicity.
15. Signs of phytotoxic action:
16. - a decrease in the germination of seeds;
17. - The formation of sterile pollen;
18. - violation of fruit formation;
19. - burns, leaf chlorosis, their fall;
20. - curvature of the stems;
21. - oppression of growth and development;
22. - Reducing the crop and deterioration of its quality.

Peculiarities of penetration, movement and metabolism of pesticides in plants

Pesticides penetrate plants through the root system or vegetative parts of plants (leaves, stem, bark).

Through the root system soil preparations come in, which are applied directly to the soil, and seed treaters, which enter the soil with treated seeds.

The absorption of pesticides by roots occurs in the same way as the absorption of nutrients - as a result of diffusion, exchange adsorption and active transfer of molecules and ions.

The intensity of the entry of pesticides from the soil solution into plants depends on:

1.The mechanical composition of the soil (clay soils adsorb pesticides more strongly, and therefore they become less available to plants);

2.Humus content (soils with a high content of humus reduce the entry of pesticide into the plant due to the high adsorption capacity);

3.Soil moisture (sufficient moisture contributes not only to the flow of water, nutrients, but also pesticides);

4.Doses of the drug (the higher it is, the more intense the intake of pesticides).

When processing vegetative plants, pesticides penetrate through the leaves, stems (cuticle and stomata) in the form of liquid and vapor.

The cuticle covers the entire leaf surface in the form of a continuous film and serves as an obstacle to the penetration of pesticides into the leaf. The cuticle is capable of absorbing

more than just water, so pesticides only enter the plant through the leaves if they are in the form of a solution or emulsion. After crystallization, any penetration of substances stops.

Pesticides absorbed by the plant can move through the phloem and xylem with the transpiration current. Pesticides move mainly to fast-growing parts of the plant.

In plants, pesticides are metabolized by enzyme systems. The metabolic rate is different (from 7 to 20 days) and depends on the properties of the drug, species and age characteristics of crops. In young plants, this process is faster than in old ones, which is explained by the higher physiological activity of the former. Different pesticides are metabolized in different ways in plants, eventually forming degradation products.

15. Measures to protect the environment from pesticide pollution

1.Combination of the use of pesticides with other methods (agrotechnical, biological, physical, etc.) - integrated protection;

2. Application of promising forms of pesticides (replacement of dusts, dry powders with new forms: granular, encapsulated, aerosols);

3. Reducing the aerial and increasing the land method of applying pesticides. (It is advisable to use ground boom sprayers and use low liquid consumption rates of 5-25 l/ha);

4. Reducing the use of persistent pesticides (to reduce the volume of use of HOS, to increase the production and use of FOS, carbamates, thio- and dithiocarbamates);

5. Alternating the use of pesticides with a different mechanism of action (in order to prevent the emergence of resistant forms of pests and pathogens);

6. Proper technology for the use of pesticides (observance of the rules for storage, transportation and application of pesticides).

16. Organic farming

Fuel shortages, increased spending on chemicals and pollution raise doubts about the longevity of intensive farming. Man must return to natural methods of farming, taking into account natural cycles. These practices are based on ecological principles and are known as organic farming. Organic farming, based on the rotation of certain crops and the use of manure as a fertilizer, is successfully developing these days. It not only does not harm the environment, but even improves it by returning a lot of organic waste to the soil, due to which the content of humus and minerals in it increases and all natural cycles are active.

Ecologists believe that crop rotation should spread everywhere. Many people prefer to eat organic food because they do not contain chemicals and their production does not harm the environment.

Some crops absorb nitrite from the soil, while others, such as peas and beans, release it. Annually sowing the same areas with different crops, changing them taking into account the cycles in nature, it is possible to increase the yields of these crops without harming nature.

17.Conclusion

Despite the fact that agriculture is focused on the use of cultivated plants and domestic animals, the management of this type of activity (in particular, the use of fertilizers, plant protection products) and other issues is not as simple as it might seem. In the fight against agricultural pests, along with special methods of agricultural technology, a variety of means are used: chemicals that kill pests, biological agents (parasites and predators for pests),

biological preparations of directed action (blocking pest reproduction systems). A rational pest management strategy is usually based on the use of all three methods. The task of the persons using these preparations is to choose their optimal ratio, as well as the best time and place for applying each of the methods. The criteria for optimal management is not only the achievement of the maximum yield, but also the prevention of environmental pollution, the maintenance of the normal functioning of natural communities. Agrotechnical methods can give a good effect in the fight against agricultural pests. For example, dense crops of wheat are unfavorable for the settling of locusts, which at the same time almost completely destroy sparse crops. In dense crops, its own microclimate is created: light and temperature drop sharply on the soil surface, and humidity increases. This prevents the reproduction of the pest. The technology of applying fertilizers to obtain maximum yield and long-term maintenance of soil fertility is also complex and requires a certain ecological culture. The optimal ratio between organic and mineral fertilizers, their dosage, timing of application, method and place of application, the use of irrigation and loosening of the soil, taking into account weather conditions - this is an incomplete list of factors affecting the effectiveness of fertilizer application. Many examples of irrational handling of fertilizers speak of the need for careful and serious performance of all work in this branch of agriculture. The general strategy of agricultural production is associated with intensive farming and animal husbandry, the use of optimal methods of agricultural technology, maintaining soil fertility, and pest control. As well as the creation of new agricultural technology and processes occurring in them.

Based on the foregoing, it becomes clear that agriculture, as a factor, has a huge impact on the environment, including human health, while it can carry a positive, but mostly negative impact.

Taking into account the above, LLC "------" undertakes to implement the technologies for the import, storage and use of insecticides and environmental protection measures when using these substances.

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