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THE PROBLEM OF UNUTILIZED AND BANNED PESTICIDES IN KAZAKHSTAN (review)

Abstract. The article presents a review about the problems of obsolete and dangerous pesticides in the world and in Kazakhstan. The huge production of pesticides, including persistent organic pollutants (POPs), it's excessive supply by agro-industrial companies, the socio-economic restructuring of entire agricultural infrastructure in CIS countries associated with the liquidation of collective farms, and processes of land privatization led to the accumulation of tons of obsolete pesticides in the global scale. Unutilized pesticides are stored in dilapidated or destroyed warehouses, and they can get into the environment with rain, wind, floods, landslides and fires. The contradictory results of obsolete pesticides inventory in Kazakhstan indicate that a scientific approach is necessary for a careful analysis of contamination foci and the development of methods for reclamation of territories contaminated by pesticides. According to the World Health Organization (WHO), active ingredients of some pesticides represent a risk of acute influence on health. Among the 57 pesticides which were approved for use in the country, 29 pesticides are hazardous. In this regard, it is necessary to take measures to stop the import of severely hazardous pesticides and do the utilization of banned POPs.

Key words: obsolete pesticides, unutilized pesticides, reclamation, environment.

Introduction. The industrialization of the agriculture has increased the chemical load on natural ecosystems. Intensive chemicalization of agriculture has led to an increase in yields, but, at the same time, to the pollution of the environment by pesticides and other chemical compounds. The use of pesticides is claimed by the commercial interest of industrial agricultural production. Pesticides are used to control insect pests (insecticides) and various parasites, plant diseases, pathogenic fungi (fungicides), weeds (herbicides), warm-blooded pests of seeds and grain products (zoocides), wood, as well with transmitters of dangerous human and animal diseases. For today it is necessary to ascertain the economic feasibility of using in agriculture the chemical plant protection products and to forecast further increase of their imports, expansion of the sphere of application and rapid renewal of the assortment. For example, in Cameroon, tomato yield losses from pest and diseases are high and can reach 100%, if the crop was not treated by insecticides [1].

In the world, the use of pesticides and the volume of pesticide production are increasing from year to year. Approximately 2.3 million tons of industrial pesticides are used annually. This is due to the need of maintenance the food for the growing world population [2]. For example, 13.1 kg/ha of pesticides are

used in Japan, 59.4 kg/ha - in the Bahamas, 8.8 kg/ha – in the Netherlands. In Argentina, Bangladesh, Thailand, Brazil, Chile, China and Canada, more than 20 million kilograms of pesticides were used annually between 1990 and 2012 [3].

Although areas of agricultural land were decreased between 2011 and 2015, the volume of chemical plant protection products application was not reduced Currently, the area of agricultural land in Kazakhstan is about 21 million hectares. Specific application of pesticides per 1 hectare of agricultural land has increased almost 2 times (from 0.29 kg/ha in 2011 to 0.52kg/ha in 2015). During this period, the annual volume of introduced pesticides varied between 10 and 11 thousand tons. A total of 51,154.7 tons of pesticides were introduced in the last five years [4].

Hazardous pesticides. According to the World Health Organization (WHO), "hazardous pesticide" is defined as a pesticide that represents the risk of acute influence of Human health. In recent years, the term " highly hazardous pesticides" (HHP) has been expanded to include not only pesticides with acute toxic effects, but also those pesticides that cause serious chronic effects on human health. Scientific data on chronic health effects of pesticides are constantly being updated by WHO/UNEP. The active substances of pesticides affect the endocrine system and have a carcinogenic effect. Among them - pesticides from the lists of the Stockholm Convention on POPs and the Rotterdam Convention.

Due to official data, only drugs permitted for use are imported into Kazakhstan. But nevertheless, it turned out that out of 57 pesticides the active substances of 29 pesticides are classified as hazardous according to the PAN list (Pesticide Action Network list dated by January 16, 2009; table 1).

These dangerous preparations were widely used in 2003-2012 to control pests, diseases and insects. During the comparison of the list of pesticides allowed in EECCA (Eastern Europe, Caucasus and Central Asia) countries with the list of OOP (Object-oriented programming) prepared by IPEN, from 32 names in Ukraine to 10 in Belarus were found up. Conducted studies present only approximate information on the OOP. Therefore, it is necessary to take measures to stop the import and use the highly hazardous pesticides. What is their quantity on the territory of our country? And what is their real danger? This issue remains open.

One of the most dangerous pesticides are persistent organic pesticides (POPs). POPs are chemicals that contain chlorine, carbon and hydrogen. POPs are the group of toxic chemicals that gather in the environment, accumulate in the fatty tissues of living organisms and humans, causing irreparable health disturbances. POPs are not destroyed in the environment for a long time, transported by air and water masses over long distances, far from the original pollution site [5, 6].

In 2001, the Stockholm Convention was developed by world community concerned with the crucial state of environmental pollution by persistent organic pollutants. The main aim of the Stockholm Convention, which was signed by 151 countries. is to limit or stop the production and use of all intentionally produced POPs, i.e. chemicals and pesticides. The Convention also provides the progressive minimization and, as far as possible, the final cessation of unintentionally produced POPs releases, such as dioxins and furans. Implementation of the Convention will lead to the fact that the production and use of POPs will be discontinued, their stocks will be disposed, and, what is especially important, the introduction of new POPs into the environment will be prevented. Kazakhstan joint to this Convention, therefore, undertaking the obligations not to produce, not to use, or destroy stocks of chemicals deemed particularly hazardous to life.

12 chemical substances, of which 9 are pesticides (DDT, aldrin, dieldrin, endrin, chlorodan, heptachlor, mirex and toxaphene) came under the jurisdiction of the Convention. The list of POPs is constantly enriched with new substances. For example, at the fourth meeting of Parties of the Conference, which was held in 2009, nine additional chemicals were included to POPs list, including five pesticides (chlordecane, α-hexachlorocyclohexane, β-hexachlorocyclohexane, lindane, pentachlorobenzene). To the state of 2013, the list of POPs included 14 names of organochlorine pesticides [7]. In 2015, the list included brominated flame retardants and associated with them precursors as perfluorinated alkylated substances [8].

The persistent organic pollutants (POPs), are particularly dangerous among call chemical pollutants of the environment [9, 10]. The POPs problem has recently become particularly acute among a number of global environmental threats. POPs compounds are difficult to decompose and accumulate in living organisms. POPs are transported over long distances through air, water, and the insects, birds and migrating

Table 1 – Pesticides, which were included in the list of highly hazardous pesticides (2009)

Name	Classification	Active substance	Toxic effect
Pesticides from the class of organophosphorus pesticides			
Dursban	Insecticide	Chlorpyrifos	Very toxic
Sumithione	Insecticide	Fenitrothion	Carcinogen category 1
Quikfos	Fumigant	Phosphine	Very toxic
Nurell-D	Insecticide	Cypermethrin	Carcinogen, toxic
Phosphamide	Insecticide	Dimethoate	Carcinogen category 1
Pesticides from the class of organochlorine pesticides			
Daconyl	Fungicide	Chlorothalonil	Carcinogen, toxic
Sportak	Fungicide	Prochloraz	Bioaccumulative, toxic
Diphezan	Herbicide	Chlorsulfuron	Bioaccumulative, toxic
Dual	Herbicide	Metalochlor	Bioaccumulative, toxic
Cross	Herbicide	Chlorsulfuron	Bioaccumulative, toxic
Oktigen	Herbicide	Chlorsulfuron	Bioaccumulative, toxic
Trophy	Herbicide	Acetochlor	Carcinogen category 1
Trophy-super	Herbicide	Acetochlor	Carcinogen category 1
Pesticides from the class of synthetic peritroids			
Buldock	Insecticide	Beta-siflutrin	Very toxic
Fastak	Insecticide	Beta-siflutrin	Very toxic
Kinmiks	Insecticide	Beta-siflutrin	Very toxic
Politrin	Insecticide	Cypermethrin	Possible carcinogen
Sherpa	Insecticide	Cypermethrin	Possible carcinogen
Karate	Insecticide	Lambda-cyhalothrin	Endocrine system destroyer
Ustad	Insecticide	Cypermethrin	Possible carcinogen
Cyrax	Insecticide	Cypermethrin	Possible carcinogen
Cytcore	Insecticide	Cypermethrin	Possible carcinogen
Rovikurt	Insecticide	Permethrin	Carcinogen category 1
Atilcord	Insecticide	Cypermethrin	Possible carcinogen
Decil	Insecticide	Deltametrin	Endocrine system destroyer
Pesticides from the class of metal-containing compounds			
Methyl bromide	Insecticide	Methyl bromide	Carcinogen category 1
Pesticides from the class of simm-triazine pesticides			
Gezagard-50	Herbicide	Prometrin	Carcinogen category 1
Lentagran -Comby	Herbicide	15% atrazine	Carcinogen category 1
Pesticides from a new class of imidazoline pesticides			
Pivot	Herbicide	Imazetapir	Toxic

warm-blooded animals contribute to it. Even in small doses, POPs pose a real threat to human and nature. POPs are slightly soluble in water and are highly soluble in fats (oils), that's why POPs accumulate in the fat tissue of living organisms. Their POPs concentration can increase in thousands and tens of thousands of times moving along the food chain.

Persistent organic pesticides are characterized by the following features:

– they remain in the environment for a long time until their full decomposition;

– they transmitted over long distances, even to areas far from thousands of kilometers from their emission sources;

– they are accumulated in the tissues of all living organisms penetrating with food, drinking water or atmospheric air;

– they poison human and animals, causing a wide spectrum of toxic disturbances;

– they have a mutagenic, teratogenic or carcinogenic effect;

– they can also concentrate as they move along the trophic chain: "soil - plant - animal - human" locally increasing the accumulation level in the body.

The ratification of the Stockholm Convention by the Republic of Kazakhstan shows that the country turned to integration into the worldwide process of cooperation in the field of human health care and improve the environment quality (The Law of the RK was ratified on June 7, 2007, № 259-III). Kazakhstan took obligations not to produce, not use, and also dispose the stocks of chemicals that are considered especially dangerous for human life. Kazakhstan is a member of international cooperation and legislative acts of the Republic of Kazakhstan in the field of environmental protection:

– Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Ratified by the Law of the RK on February 10, 2003. № 389-II;

– Rotterdam Convention on the procedure of preliminary informed agreement on separate hazardous chemicals and pesticides in international trade. Ratified by the Law of the RK on March 20, 2007;

– Instruction "On the procedure for disposal or destruction of proscribed and degraded pesticides and packaging", 1996;

– the laws "On Environmental Protection", "On Subsoil and Subsoil Use, 1997;

– President of the Republic of Kazakhstan issued a decree "On the concept of ecological security of the Republic of Kazakhstan for 2004-2015, - 2003;

– Ecological Code of the Republic of Kazakhstan, Law of the Republic of Kazakhstan № 212-III. 2007.

Obsolete pesticides. Pesticides become obsolete and undesirable when they are not suitable for use because of: unsatisfactory storage conditions that lead to damage or change in chemical composition or loss of product properties; expiration of the shelf life; prohibition of use and other changes relating to product registration and permit for its use [11].

The huge production of pesticides, including POPs, it's excessive supply by agro-industrial companies, the socio-economic restructuring of entire agricultural infrastructure in CIS countries associated with the liquidation of collective farms, and processes of land privatization led to the accumulation of tons of obsolete pesticides in the global scale [12, 13]. According to the International HCH & Pesticides Association, the exact amount of obsolete pesticides in the countries of the former Soviet Union has not been established and data vary greatly [8]. In 2007, the quantity of obsolete pesticides in Belarus amounted to 6558 tons, and 20,000 tons were inventoried in frame of the project GCP/RER/ 040/EU. In 2005, the registered quantity of obsolete pesticides for Uzbekistan was 17,718 tons, but later the UNEP/POPs/INC.5/1 project reported about 40,000 tons. It is known, that in the Russian Federation stocks of obsolete pesticides, which left over from the Soviet times, usually located near the former collective farms, and often in the vicinity of remote villages or forestry [14]. In Ukraine, a preliminary inventory has identified more than 3,000 pesticide stores, including nearly 2,000 destroyed warehouses, in which stored about 33,000 tons of obsolete pesticides [15].

In Kazakhstan, pesticides with properties of POPs have never been produced, they are not currently imported or exported. Export and import of POPs containing pesticides are prohibited in accordance with the legislation of the Republic of Kazakhstan. But, significant amounts of previously produced POPs, which were used in the former USSR, have been stored in Kazakhstan. The main sources of pollution by POPs in Kazakhstan there are:

1) obsolete and unusable pesticides (including those with POPs properties) in agriculture;

2) equipment containing PCBs (polychlorinated biphenyls) used in industry and transport;

3) use in industry of technologies leading to unintentional release of dioxins and furans;

4) the formation of dioxins and furans in the process of open burning.

Foci of soil pollution by residues of POPs containing pesticides are numerous and chaotically distributed throughout the country. Only 20% of the country's territory covers the sites of POPs containing pesticides inventory [4]. Due to the lack of a full-scale inventory in the Republic of Kazakhstan, data on the number of storage facilities, as well as on the quantity and quality of obsolete pesticides, are contra-

dictory. For example, according to one data there are 974 warehouses, 411 of which are in an emergency condition [16]. According to other information [17], there are 1280 warehouses, out of them in emergency condition - 236. The Department of environmental protection in Almaty region considers that 87 tons of obsolete pesticides are subject to utilization, whereas, according to the Ministry of Agriculture, only 126 tons should be destroyed [17]. According to UNEP (data of 2004), in result of inventory of obsolete pesticides, in Kazakhstan, more than 1,500 tons of banned, unusable pesticides and their mixtures of unknown composition were registered. 2008 data indicate that their number reached 10,000 tons [18, 19].

According to the Ministry of Agriculture RK data, reported in July 2012, about 6,931.4 tons of obsolete, banned and unsuitable for use of pesticides are still stored in warehouses of various regions of the country [19].

During the inventory, done in 2009-2010 in the frame of the scientific international program, 64 storage facilities of plant protection chemicals were detected in 10 districts of Almaty region. There were accumulated 68443 kg of obsolete and unusable pesticides. Among them, there were 350 kg of prohibited pesticides (saifos, metaphos), 35543 kg of pesticides with etiquettes and 32550 kg of pesticide mixtures of unknown composition, that consists 79% from total number. There were detected the pesticides from the classes of simm-triazine (atrazine, protrazine, propazin, ziazin), organophosphorus (saiphos, metaphos), chlorine-containing (nitrophene and illoxane), fluorine-containing (treflan), thio-carbamate (temik), as well as pesticides of German and Chinese origin (50% Thirams and Hataonyag).

POPs containing pesticides were not detected during this inventory. However, the results of organoclorine pesticides determining in soil samples, which were taken around 64 former storage facilities of pesticides, have demonstrated that soil around 24 former repositories was contaminated by metabolites of 2,4 DDD; 4,4 DDD; 4,4 DDT; 4,4 DDE and isomers of hexachlorane (α-HCH, β-HCH and γ-HCH. The most polluted regions were Eskildinsky, Talgar, Karasai, Enbekshi-Kazakh districts. The main pollutants were lindane, β-isomer of hexachlorane and metabolites 4,4'DDE and 4,4'DDT. In addition to these metabolites, in soil samples from many regions, there were α-HCH, 4,4-DDD and 2,4-DDD. According to normative documents of Kazakhstan, their presence in the soil is unacceptable [20, 21]. It is known that they are highly toxic agents with expressed skin-resorption toxicity. They cause mutagenic, antimitotic and embryotoxic effects [22].

Despite an inventory based on official figures by the Ministry of Environment of the Republic of Kazakhstan, Ministry of Agriculture of the Republic of Kazakhstan, non-governmental organizations and the Republican Sanitary-epidemiological Station Agency for Health Affairs of the Republic of Kazakhstan, unfortunately, at present there is no complete information on the use of pesticides in our country.

The causes:

– no complete information on the use of pesticides in our country; no waste management strategy in the state scale;

– absent irrational agriculture management methods, which have become the norm for farms and enterprises,

– insufficient regulatory framework;

– lack of economic incentives for the liquidation of waste disposal sites

– no the objective scientific information on the extent of soil contamination with obsolete pesticides, the locations of the former warehouses of chemical plant protection products in different geographical zones of Kazakhstan;

– no the modern laboratory capable of identifying a mixture of obsolete pesticides at the level of international standard;

– no the reliable data on what classes of obsolete pesticides and in what quantities were not buried and disposed of in various region of Kazakhstan.

Impact of obsolete pesticides on the environment. The vast majority of pesticides are poisonous chemicals that poison the target organisms. First of all, the potential danger of pesticides for the environment is explained by the fact that the overwhelming majority of synthetic chemical substances are unnatural. Among all pollutants of nature, the synthetic chemicals are ranked in top ten. They are consciously introduced into the biosphere by a human. And, the scale of introducing of synthetic compounds to the nature increases.

Growth inhibitors and sterilizers, substances causing infertility are also used as pesticides. Under the pesticides influence, some of the biological reactions are stopped, and this allows to human fight the plant diseases, keep food longer, and destroy pests [9]. But a significant decrease of such products qualities as trace element compositions, usefulness and consumer health safety are not taken into account. As a result, the destruction of biocenoses in areas where pesticides are used become the global problem [9, 10].

Unlike other pollutants (radionuclides, heavy metals, etc.), the real danger of pesticides is not fully understood. This is because pesticides are the hundreds of active substances and tens of thousands drugs. The methods of their analysis in the environment are complex, expensive, laborious, imperfect and not always reliable. The lack of information on pesticides ecotoxicological properties is the main reason for their danger. The long-term environmental consequences of pesticides usage have not been studied yet. Analysis of research results regarding the pesticides genetic activity in model test systems has shown that many of them are mutagens [23-25]. Of the 400 studied pesticides, 262 substances (65%) showed the mutagenic activity at any test objects. We should understand that pesticides mutagenicity has a tendency to increase with more number of test systems used because of pesticides synergistic effect [25].

The main problems associated with the use of pesticides in agriculture are their resistance in soil and toxicity to non-target organisms [26] that expresses even at low concentrations [27].

The large-scale use of chemicals to support agriculture adversely affects human health and the environment, depletes the natural resource agriculture base because 60-95% of introduced pesticides do not directly suppress objects, thereby damaging the environment [28, 29].

The doses of a number of pesticides used in agriculture are similar to chemical mutagens, which cause a negative genetic effect. Thus, when studying 407 pesticides for mutagenicity, 263 of them had mutagenic activity and represented a genetic hazard [30].

Posing specific biological activity, pesticides cause not only the death of those organisms against which they were applied, but also cause disruption of vital processes of other organisms, including humans, animals and plants [31, 32]. Genetic examination of persons who have professional contact with pesticides has shown that many pesticides (ciram, zineb, TMTD, benomyl, polychloroprene, polychlorochamber, katoran, etc.) significantly increase the frequency of chromosomal aberrations in peripheral blood lymphocytes in people contacting with pesticides [24, 33].

Pesticides are widely used in agriculture because they can save up to 40% of the crop from losses. However, due to violations of storage technologies and usage, up to 95% of introduced pesticides do not reach the suppressed targets and cause the huge damage to the environment. Application of pesticides without taking into account the natural and climatic conditions of the territories under treatment, the violation of the pesticides management protocols, including rejection of necessary safety measures, creates the serious problems, such as - reducing biodiversity; the death of wild animals and livestock, poisoning; violation of natural control over the different pests quantities; accumulation of a significant amount of obsolete unusable chemicals which are the dangerous sources of environmental pollution; the ingestion of pesticides residual amounts in feed and food; contamination of surface and ground waters. The contaminated food, feed and drinking water are the main sources of pesticide intake into the human body.

The main problem of contaminated soils is the danger to human health from accidental contamination of polluted soil. This is acute question, especially for children. Concern for human health and the environment is mainly related to the long-term effects of certain substances. Endocrine disorders, violations in reproductive function and carcinogenicity are the most often noticeable long-term effects [27].

Long-term effects of pesticides, especially at low doses, and their possible synergism with other environmental pollutants and disease transmitters have been poorly studied due to the relative novelty of most pesticides. However, metabolites of pesticides that remain in food cannot cause the toxic or lethal effects, but they reduce the resistance to diseases and gradually accumulate in the body to a dangerous level [34].

Mutagenic activity of pesticides is one of the most dangerous manifestations of negative influence on human health and its offspring. In the past 10 years, research of pesticides effects on human health has been actively conducted [32-37]. It was proved that some pesticides are carcinogens and cause the development of various cancer types [32, 38]. Pesticides often cause allergies, diathesis and respiratory diseases [39, 40]. Many pesticides are associated with the neurodegenerative diseases development

[32, 35, 41, 42], such as Alzheimer's and Parkinson's. Endocrine diseases [34], problems of female and male reproductive systems [43, 44], type 2 diabetes mellitus [45], metabolic syndromes and obesity, developmental disorders [45] are not a complete list of pesticides impacts on human health. The congenital malformations, which constitute an essential part of the overall morbidity and mortality, are the most serious deviations in children health status. The intrauterine effect of some pesticides increases the risk of lung diseases development in future of child, while the risk of the disease in children increases in direct proportion to the concentration of the pesticide in the mother's blood during pregnancy. Harm from pesticides to children's body is manifested in hyperactivity in children (ADHD), autism.

Multiple effects of pesticides on public health were the reason of fact, that in 2017, UN experts announced the falsity of the claim that pesticides should be used to ensure food safety. Data on 200,000 fatal poisonings by pesticides per year and evidence of permanent contact with pesticides is associated with a wide range of diseases, developmental disorders and sterility were presented [46].

Polish scientists A. Buczynska and I. Szadkowska-Stanczk [47] studied the impact of pesticide release on the population living near these places and assessed their impact on health. Out of the 286 pesticide discharge sites in Poland, 40 were selected as the largest source of environmental hazard. In one of the investigated sites, the level of exposure of 2,4-D to the population caused nephrotic and hepatotoxic effects, as well as reproductive disorders. Studies have shown that, even four years after the discharge site was closed, the content of pesticide residues in groundwater was still high.

In today's world, threats to ecosystems and biodiversity are multidimensional: from localized loss of habitats from pollution to the global consequences of climate change. Existing environmental risks from obsolete pesticides stocks are soil degradation, migration of pesticides from contaminated soil to groundwater; contamination of surface waters, migration of pesticides to air by volatilization; the spread of pesticide dust or pesticide-contaminated soil particles by wind and large-scale spreading as a result of natural and emergency disasters such as hurricanes, earth-shaking and flooding.

Recultivation of territories contaminated by obsolete pesticides. Cleaning the soil from obsolete pesticides is a complex and expensive process. As usual, obsolete pesticides are burned in high-temperature furnaces, or buried in special burial grounds. These large-scale and costly rehabilitation technologies are all-effective. But in developing countries, they are not available due to limited financial resources. Despite this, in the frame of ASP program (2003), a large quantities of pesticides were completely or partially destroyed in a number of African countries (Egypt, Namibia, Niger, Senegal, Seychelles, South Africa, Sudan, Tanzania, Uganda, Zambia) in Eastern Europe and in some countries of the former USSR [48].

Moldova was one of the first countries of the former Soviet Union which considered its legacy of obsolete pesticides [49]. Since 2005, this country has been active in the utilization of obsolete pesticides with the support of the Global Environment Facility/World Bank (2006-2010). About 3,350 tons of obsolete pesticides were repackaged, of which 1,292 tons were burned in high-temperature ovens abroad. In 2011-2012, an additional 200 tons of obsolete pesticides were burned in the Czech Republic.

In Armenia, 7100 tons of POP wastes in the form of highly polluted soil, 1050 tons of POPs containing pesticides and 12.7 thousand tons of other obsolete pesticides were burned in high-temperature furnaces. Tons of soils which less polluted by POPs were buried with the support of FAO. Within the framework of the Arctic Council's Action Plan for the Elimination of Arctic Pollution, about 2000 tons of POPs pesticides were repackaged in North-West Russia [14]. In 2010-2013, 10000 tons of hexachlorobenzene from the west of Ukraine was transported to Poland and Germany for burning [50]. Along with physical methods, expensive chemical tools are used, such as immobilization or soil washing. But they are not suitable for large-scale soil restoration activities [51-53].

However, for many CIS countries, including Kazakhstan, the issues of the obsolete pesticides utilization remain open. Taking into account the dangerous of obsolete pesticides and the need of their utilization or disposal, certain legislative acts have been accepted in Kazakhstan [53]. Despite these measures, the problem of pesticides utilization remains topical.

There are main reasons:

– lack of management and objective scientific evidence on the degree of soil contamination by obsolete and unusable pesticides in various geographic areas of Kazakhstan;

– there is no reliable data on the location of the destroyed warehouses, where previously, before 1991 (before the collapse of the USSR), pesticides including POPs were stored.

The agrarian sector is dominant in Kazakhstan. The regions supply agricultural products (vegetables, fruits, meat, milk, etc.) not only in large megacities and its neighborhood, but all industrial and rural districts of Kazakhstan. Obsolete pesticides sites are dangerous sources of environmental pollution. And the urgent measures should be taken to characterize them and then eliminate them.

In this connection, since 2018, within the framework of the MES KN RK scientific-technical program "Comprehensive assessment of unutilized and banned pesticides impact on genetic status and health of population of Almaty region" (BR05236379), a cadaster of obsolete stocks and locations of former storage pesticides is being developed. The program implementation plan based on usage a multi-level approach including: detection of POPs decay products in soil, water, agricultural products; testing it for mutagenicity/genotoxicity in model experiments; reveal the genetic effects on living systems of different organization levels; test the population health status; conduct the molecular genetics and cytogenetic analysis of population, estimate the genetic risk for human health and future generations, and develop the practical and preventive recommendations. Thus, the complex evaluation of long-term influences of obsolete pesticides to the biocenoses and components of the human food chain will be obtained taking into account the health risk to population living in the Talgar district Almaty region.

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ҚАЗАҚСТАНДА ЕСКІРГЕН ПЕСТИЦИДТЕР МӘСЕЛЕСІ (шолу)

Аннотация. Мақалада әлемдегі және Қазақстандағы ескірген және қауіпті пестицидтердің мәселелеріне әдебиеттік шолулар жасалған. Пестицидтердің, оның ішінде тұрақты органикалық ластағыштардың (ТОЛ) шамадан тыс көптеп өндірілуі, агроөнеркәсіптік компаниялардың шектен тыс қолдануы, ТМД елдерінде, оның ішінде Қазақстанда ауыл шаруашылық инфрақұрылымды құрайтын колхоздар мен совхоздардың жабылуы және Жерді жекешелендіру жұмыстары ескі қолданылмаған пестицидтердің үлкен көлемде жинақталуын тудырды. Бұл жарамсыз пестицидтер қазіргі кезде бұзылған қоймаларда сақталуда және олар сыртқы ортаға жауын сулары, жел, су тасқыны немесе басқалары арқылы таралуы мүмкін. Ескі пестицидтерді инвентаризациялау бойынша қарама-қарсы нәтижелердің болуына байланысты ластанған аймақтарды талдау және топырақ құнарлығын қайта қалпына келтіруге ғылыми тұрғыдан амалдар қажет. Ескі пестицидтермен қатар қазіргі кезде қолданылатын пестицидтердің өзін Дүниежүзілік Денсаулық Сақтау Ұйымы (ДДСҰ) адам денсаулығына қауіп келтіретінін көрсетіп отыр. Қазақстан Республикасында қолдануға рұқсат етілген 57 пестицид түрінің 29-ы қауіпті деп саналады. Осыған байланысты, қауіпті деп танылған пестицидтерді шеттен әкелуге тыйым салу керек.

Түйін сөздер: ескі пестицидтер, қауіпті пестицидтер, топырақ құнарлығын қайта қалпына келтіру, қоршаған орта.

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ПРОБЛЕМА УСТАРЕВШИХ ПЕСТИЦИДОВ В КАЗАХСТАНЕ (обзор)

Аннотация. В статье представлен литературный обзор о проблемах устаревших и опасных пестицидов в мире, в том числе Казахстане. Огромное производство пестицидов, в том числе стойких органических загрязнителей (СОЗ), чрезмерная закупка агропромышленными компаниями социально-экономическая перестройка, связанные с ликвидацией колхозов и совхозов, приватизацией земель, а также всей инфраструктуры

сельского хозяйства странах СНГ, в том числе Казахстане привело к накоплению тонны устаревших пестицидов в глобальном масштабе. Устаревшие пестициды хранятся в ветхих либо разрушенных складах, и они могут попадать в окружающую среду с дождем, ветром, в результате наводнений, оползней и пожаров. Противоречивые результаты инвентаризации устаревших пестицидов в стране свидетельствуют о том, что необходим научный подход для тщательного анализа очагов загрязнения и разработке методов рекультивации территорий, загрязненных устаревшими пестицидами. Наряду с устаревшими пестицидами среди используемых пестицидов согласно Всемирной организации здравоохранения (ВОЗ) действующие вещества некоторых пестицидов представляют риск острого воздействия на здоровье человека. Среди разрешенных к применению 57 наименовании пестицидов в стране действующее вещество 29 препаратов относятся к опасным. Необходимо принять меры по прекращению импорта особо опасных пестицидов.

Ключевые слова: устаревшие пестициды, опасные пестициды, рекультивация, окружающая среда.

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