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MYCOTOXINS AND HEAVY METALS IN GRAIN CROPS

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Cereals have long occupied an important place in human nutrition, being an affordable source of trace elements, proteins, carbohydrates and vitamins. The most common cereal crop in many countries of the world is wheat, which has been widely used in the manufacture of various types of food, cosmetics, medicines, feed for farm animals. Due to the presence of a large number of substances useful for the human body, wheat helps to strengthen the immune system, creates a powerful barrier to the development of cancer. The main food products of most residents of Kazakhstan are bread, bakery products, flour, cereals, pasta. In Kazakhstan, wheat is the leader in sown areas, harvested and exported. Depending on the soil, natural and climatic conditions of a particular region, there are priorities in the cultivation of this grain crop. With a large fund of agricultural land, Kazakhstan forced to take into account adverse climate conditions, geographical location and other features of the environment, which significantly complicates the successful development of agriculture. To achieve a high yield, high-quality soil preparation before sowing is of great importance. Having a weak root system, wheat is moody about phytosanitary condition of the soil and crops cultivated in front of it. Preferably, the precursors will be corn, buckwheat or leguminous plants that saturate the soil with nitrogen, contributing to the accumulation of easily digestible nutrients. Compliance with a two-year hiatus in wheat rotation, autumn tillage tillage also increase the soil's resistance to moisture accumulation, reduce the number of weeds and harmful insects, which favorably affects crop yields.[1]

To ensure food safety, it is necessary to achieve the use of environmentally friendly and harmless raw materials for their production, and especially grain, which is the basis of the population's nutrition. In many countries of the world, monitoring systems have been developed and operate to monitor the contamination of food raw materials and food products with foreign substances, the content of which is strictly regulated. However, on this issue, many issues require additional study, development and implementation in practice. This is especially true for mycotoxins - especially dangerous contaminants of food products found in natural conditions. Mycotoxins, widely distributed in grains, oilseeds and legumes of most countries of the world, pose a real danger to public health.[2]

The introduction and improvement of the system for protecting grain crops in Kazakhstan, in which the biological method plays the main role, is promising. The high resistance of some microorganisms to high temperatures and chemical elements makes it advisable to carry out preventive measures that exclude their synthesis and accumulation.

The article discusses the main sources of pollution of the crops of major crops by harmful elements of various nature, methods for assessing the level of contamination[3]

Characteristics of grain safety indicators.

The safety of crops is ensured by identifying the maximum acceptable levels of safety indicators, which include toxic elements, mycotoxins, radionuclides and pesticides.

Toxic elements, the content of which is subject to control in food raw materials, including grain, include heavy metals and arsenic. Among heavy metals, lead, mercury, cadmium, zinc, and copper are considered to be especially dangerous, since they are characterized by high toxicity and the ability to accumulate in the body during long-term ingestion with food products³.

Mycotoxins are toxic products of metabolism (metabolism) of molds that form on the surface of grain and feed. About 160 species are known that have this ability. They primarily affect crops, oilseeds, fruits of vegetable and fruit plants, and products made from them. One of the most controlled mycotoxins in livestock products is aflatoxins⁴.

Radionuclides are radioactive atoms with a certain number of protons and neutrons in the nucleus, characterized by mass numbers and atomic numbers. Radionuclides with the same number of protons of one chemical element are called its radioactive isotopes. The main route of exposure to radioactive substances in humans and animals is through the oral route.

Pesticides are pesticides that are widely used as an effective means of combating pests and plant diseases and a means of protecting animals from ectoparasites. Pesticides are also used to control rodents - carriers of infectious diseases. Violation of agricultural and hygienic regulations for the use of pesticides leads to their accumulation in the environment. Pesticides that enter the earth and water break up very slowly and cause great harm to human health.

Mycotoxins are naturally occurring toxic substances produced by certain types of molds. Mold fungi parasitize on many types of food products, such as cereals, dried fruits, nuts and spices. The appearance of mold can occur both before and after harvesting, during storage and / or on finished food products in conditions of favorable temperature and high humidity. Most mycotoxins are chemically stable and are not destroyed during the heat treatment.

Among the several hundred known mycotoxins, the most common and most dangerous to human and livestock health are aflatoxins, ochratoxin A, patulin, fumonisins, zearalenone and nivalenol / deoxynivalenol. Mycotoxins enter the food chain as a result of crop damage by mold, both before and after harvesting. Mycotoxins can enter the body both directly as a result of eating contaminated food products, and indirectly, through the use of products obtained from animals that were fed contaminated food, in particular milk.

Table 1 – The effect of food mycotoxins on the human body

Pathogen	Toxic onset	Food	Clinical symptoms
Ergotism <i>Claviceps purpurea</i>	Ergot alkaloids	cereal	Adrenergic blockade
Fusariotoxicosis <i>Fusarium graminearum</i>	Fugue toxins	cereal	symptoms of severe intoxication
Alimentary Toxic Aleukia Fusarium family	Fugue toxins	Bread, made from overwintered in a grain field	the disease in one to two weeks, necrotic tonsillitis, a decrease in the number of hemoglobin granulocytes, lymphocytosis
Aflatoxicosis <i>Aspergillus flavus</i> Link ex Fries	Aflatoxins	various food raw materials peanuts, corn, cotton seeds	the most powerful hepatotropic poison with a long-term carcinogenic effect, mutagenic activity, cytotoxic effect, effect on the central nervous system immunotoxicity, effect

			on reproductive function
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WHO, in collaboration with FAO, is responsible for assessing the risk that mycotoxins pose to humans as a result of contamination of food, and making recommendations for the necessary protection.

The risk assessment of the presence of mycotoxins in food is carried out by the FAO / WHO Expert Committee on Food Additives (JECFA) and is used by national governments and the Codex Alimentarius Commission (the regulatory intergovernmental body on food standards) to determine the maximum permissible concentration of various impurities in food or making other risk management recommendations to prevent or reduce contamination. Codex standards are an international benchmark for national food producers and food traders and are designed to guarantee consumers around the world that their food products meet established safety and quality standards, wherever they are produced.

JECFA sets tolerance levels for various mycotoxins

JECFA or FAO / WHO ad hoc scientific expert groups include independent international experts who conduct scientific reviews of all published studies and other data on individual mycotoxins. Based on the results of this work on health risk assessment, either maximum allowable levels of consumption are established or other recommendations are formulated to indicate the degree of health hazard (for example, exposure limits). Recommendations are made regarding risk management and measures to prevent and reduce contamination, as well as analytical methods and measures for monitoring and control.

From a large number of various chemicals entering the environment from anthropogenic sources, heavy metals occupy a special place. In modern conditions of environmental pollution by heavy metals, the issue of crop quality stability takes on a certain meaning, which is interpreted as the possibility of obtaining crop products suitable for human consumption [8]. Entering plants in excess, heavy metals inhibit the normal course of metabolic processes, making plant products dangerous. High concentrations of heavy metals block active centers in enzymes, weaken the energy of cells, reduce protein synthesis and photosynthesis, disrupt water exchange, etc. [3]. Grain of cereal crops is widely used in food and animal feed, flour, pasta and cereals are made from it, including for baby and diet food, so the study of the content of heavy metals is very important.

Table 2 – Distribution of chemical pollutants by hazard class

Hazard Class	Chemical pollutant
1st	Arsenic, cadmium, mercury, lead, zinc, fluorine, 3,4-benz (a) pyrene
2nd	Boron, cobalt, nickel, molybdenum, copper, antimony, chrome
3rd	Barium, vanadium, tungsten, manganese, strontium, acetophenone

Many heavy metals, such as iron, copper, zinc, molybdenum, are involved in biological processes and in certain quantities are necessary for the functioning of plants, animals and humans by trace elements. On the other hand, heavy metals and their compounds can have a harmful effect on the human body, can accumulate in tissues, causing a number of diseases. Metals that do not have a useful role in biological processes, such as lead and mercury, are defined as toxic metals. Some elements, such as vanadium or cadmium, which usually have a toxic effect on living organisms, may be useful for some species [6].

Recommendations for controlling mycotoxin levels

1. The control of mycotoxins, primarily aflatoxins, is carried out at all stages of production, acceptance, post-harvest processing, storage, processing and tempering of grain.

2. Sampling for the analysis of mycotoxins should be carried out in accordance with GOST 13586.3-83 "Grain. Acceptance rules and sampling methods." Sample weight of at least 5 kg.

3. The sampling frequency should be set depending on the initial quality and storage conditions of the grain. It is mandatory to carry out sampling and analysis for aflatoxins from lots of wheat that underwent self-heating at temperatures above 30 ° C for 6 days or more.

4. Compliance with agricultural cultivation.

5. Thorough and timely cleaning of grain, ensuring the removal of injured, puny, underdeveloped grains, as well as impurities of mineral and organic origin.

6. Drying and high-temperature processing of grain in grain dryers, providing a reduction of up to 99% of potentially toxigenic mycoflora.

7. Timely and uniform cooling of grain after drying, which is a guarantee of further safe storage of grain.

8. Reducing the storage period of raw and wet grain until it is dried, especially at humidity and temperature exceeding 18 ° C and 20 ° C, respectively: for wheat - 4 days.

9. Providing regular monitoring of the temperature and humidity regime of the grain mass in layers, allowing timely detection of foci of increased humidity or temperature.

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CURRENT ENVIRONMENTAL PROBLEMS: PLASTIC POLLUTION

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Keywords: plastic pollution, retailers, coffee houses, plastic cups, "My cup, please".

This article discusses the current level of plastic pollution in the world. Nowadays international organizations are trying to find solutions to prevent environmental disasters. This scientific project aims to find out how much the local population is aware of environmental issues and how plastic is harmful to flora and fauna. The article presents an ecological project that can partially reduce the consumption of disposable paper cups. The main purpose of the article is to educate as many people as possible about current environmental issues.