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ECOLOGICAL IMPACT OF TECHNOGENIC FACTORS ON PLANTS AND AGROECOSYSTEMS

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Annotatsiya: Mazkur ishda texnogen omillarning o‘simliklar, tuproq va agroekotizimlarga ekologik ta’siri yoritilgan. Atmosferaga chiqariladigan zararli gazlar va chang aralashmalari fotosintezni susaytirishi, hosildorlikni kamaytirishi, tuproqdagi biologik jarayonlarni izdan chiqarishi ilmiy manbalar asosida tahlil qilindi. Og‘ir metallar va sanoat chiqindilarining ekotizimlarga uzoq muddatli salbiy oqibatlari ko‘rsatildi.
Kalit so‘zlar: texnogen omillar, agroekotizim, SO_2, og‘ir metallar, fotosintez, hosildorlik, ekologik ifloslanish.
Annotation: This paper analyzes the ecological impact of technogenic factors on plants, soils, and agroecosystems. Industrial emissions of gases and aerosols reduce photosynthesis, decrease crop productivity, and disrupt soil biological activity. The long-term toxic effects of heavy metals and sulfur dioxide on agricultural crops are examined based on scientific evidence.
Keywords: technogenic factors, agroecosystem, sulfur dioxide, heavy metals, photosynthesis, crop yield, environmental pollution.
Аннотация: В работе рассматривается экологическое воздействие техногенных факторов на растения, почвы и агроэкосистемы. Показано, что промышленные выбросы газов и аэрозолей приводят к снижению фотосинтеза, уменьшению урожайности и нарушению биологических процессов в почве. Особое внимание уделено токсичному влиянию тяжёлых металлов и сернистого газа на сельскохозяйственные культуры.

Ключевые слова: техногенные факторы, агроэкосистема, диоксид серы, тяжёлые металлы, фотосинтез, урожайность, экологическое загрязнение.

Introduction. Natural systems and agroecosystems are an integral part of the bioecotechnosphere, and like biosystems, they also perceive the polluting effects of technogenic factors in their small parts, regionally and globally, and large negative changes occur in the formation of products and energy exchange. This situation leads to a decrease in crop productivity with a change in the qualitative and quantitative stability of the components of agroecosystems. As a result, the continuity of agricultural production is disrupted. For example, as a result of intensive emissions of gas and dust into the atmosphere around a non-ferrous metallurgy enterprise, the structure of the plant cover was disrupted, even plants disappeared, and a technogenic desert area was formed on an area of 5-10 km, and soil, surface and groundwater were poisoned. The natural state and composition of phytocenosis have changed significantly 60-70 km from the Norilsk Mining and Metallurgical Combine in Russia.

Main part. Natural systems and agroecosystems are an integral part of the bioecotechnosphere, and they are also sensitive to the accumulation of harmful substances. Gas-dust mixtures destroy the structure of the vegetation cover, poison the soil and water, and negatively affect the quality of products. For example, it has been observed that an area of 5–10 km around metallurgical

enterprises has turned into a technogenic desert. According to some scientists, in soil containing very small amounts (1/1000) of manganese, lead, and zinc, there are no earthworms at a depth of about 600 m. At 1500 meters, their number is very small, and these chemical elements “kill” the soil (Chernikov, 2000; Chekeres, 2000). The following table shows the impact of harmful emissions into the atmosphere on the productivity of agricultural crops, Table 1): As can be seen from the table, the productivity of agricultural crops in the vicinity of the source of atmospheric pollution decreased from 15.2% (roj) to 62.6% (hemp). Cows fed contaminated forage produced an average of 19.8% less milk, and their fattening decreased by 19.4-37.5%.

Table 1

The impact of harmful emissions into the atmosphere on the productivity of agricultural crops

Crop Name	**Distance from the source of waste, km**	
	2-3	5
Wheat	18,7	9,4
Rice	15,2	7,6
Barley	24,4	12,2
Oats	31,3	15,5
Corn	25,0	12,5
Potatoes	35-47	18-24
Beets	25-62	13-31
Hemp	62,6	31,3
Clover	33,1	16,6
Alfalfa	37,8	18,9

Research object and methodology. The formation of organic matter in the process of photosynthesis in cultivated plants as a result of the action of sunlight, and in this process, technogenic pollutants (gas, dust, particles, liquid substances) directly and indirectly pass through the leaves, flowers, roots, flowers, fruits of plants and are contained in the products they produce. The effect of pollutants is either visible (yellowing, drying of leaves, formation of spots, shedding of fruits) or invisible. They are present in the structure of plant cells, tissues and other organs, leading to internal biochemical changes in the plant body, as a result of which the plant (body, fruit, crop) becomes a biosource of toxic substances for the animal and human bodies.

Toxic chemical man-made substances Rb, As, G', S02, SO3, various compounds NG', SiG', NSl strongly poison plants (leaves fall off, fruits harden and become juiceless). The effect of toxic gases on plants depends on their concentration and the time of exposure. Long-term exposure to high concentrations is the most dangerous. Among toxic gases, S02, NG', NS1 have little effect

on cereals, pistachios, pumpkins, watermelons, potatoes and medicinal plants, but they have a very strong effect on forage crops, legumes, fruits with seeds, nuts, grapes, strawberries. Deciduous trees and shrubs are quickly poisoned by these toxic gases, they shed their leaves and dry up. For example, S02 has different effects depending on the plant variety, planting time, development period, light intensity, air temperature and soil moisture level. In any case, sulfur compounds reduce the photosynthesis process, the amount and production of chlorophyll, that is, the content of S02, 0.1 mg / m3 in the air reduces the yield of beans by 30%. Mesophyll tissues in corn leaves, absorbing SO2, reduce photosynthesis and its growth processes.

With the accumulation of S02 in the plant body, the accumulation of water in the cells, the influx of sugars, minerals (K, Sa) and the level of pH decrease.

According to the data of many scientists, if 70% of S02 falls on barley leaves, sulfuric acid is formed in these leaves.

The phytotoxic concentration of sulfur oxide in the air is around 50-90 μg / m3, and among plants, only potatoes are resistant to high (250 μg / m3) concentrations of S02 (Chekeres, 2000). The most dangerous toxicant for agricultural plants is fluorine. Its gaseous compounds (NG', SiG'4, N2SiG'2, SG') and solid particles and aerosols (NaG', SaG'2, Na3AlG'6, AlF3, Na2SiG'6) are also found. The amount of S02 in the atmosphere for unpolluted agroecosystems is about 1.10-4 mg/m3, and its high chemical activity is in the form of water-soluble. Fluorine compounds react with organic and inorganic components and elements in the soil and are quickly absorbed by soil complexes. Significant negative changes occur in the physicochemical and biological composition of the soil, its productivity decreases, and the resulting crop is environmentally harmful to humans and animals. When the concentration of S02 in the tissues of living organisms exceeds 1.5-2.0 mm / kg, intoxication occurs in the body - the accumulation of toxins, the formation of red-brown spots, plant development, and active growth are disrupted. Therefore, farming in areas 3 km away from fluorine-producing enterprises, mixing clean grass and straw with fluorine-affected fodder and feeding it to livestock reduces the amount of fluorine, and animal products become much cleaner. Another technogenic factor that negatively affects agroecosystems is nitrogen compounds, which, when exceeded above a certain amount, have a negative effect on agroecosystem components. High-temperature combustion releases nitrogen oxide (N0) into the atmosphere, which quickly oxidizes and turns into nitrogen dioxide (N02).

Research results. It is known that nitrogen oxides absorbed by plants are metabolized into: N02 - N03, -N02, -NN4+- amino acids - proteins are formed, but nitrites (N02 -) from nitrogen oxides formed during assimilation are very toxic and prevent the passage of various physiological processes. Ammonia accumulates in some plants, leading to cell damage. Up to 65% of nitrogen dioxide can accumulate in plant tissues. Damage to plants from the effects of nitrogen compounds is observed around large industrial enterprises, on the sides of highways, crop yields decrease, plants lose their resistance to environmental factors, and they are more susceptible to disease. It should also be noted that plants in highly polluted areas also develop resistance to toxic gases such as O3, SO2, NO2. This is especially true in pastures.

Table 2

Another aspect of the man-made impact on plants is that NO2 and SO2 gases can cause the formation of abscisic acid in plants.

Methods	Names of necessary instruments

Gravimetric	Special laboratory
Titrimetric	Special laboratory
Spectrometry	Colorimeter. Spectrophotometer
Ultraviolet spectrophotometry	UV-spectrophotometer
Atomic absorption spectroscopy	AA- spectrophotometer
Gas chromatography	Gas chromatograph
Voltammetry	Pulse polarograph, DC
Spectrofluorimetry	Spectrofluorimeter
Liquid chromatography	Liquid chromatograph
Polyarography	Polyarograph
Infrared spectroscopy	Infrared spectrometer
Microbiological	Microbiological instruments
Medical-biological	Instruments for detecting snake and insect venom
Folk medicine methods	Juice, mass, oil of plant and animal substances

Most agrochemical laboratories, factories and nature conservation organizations do not have sufficient capabilities to determine the composition of pollutants, but even so, it is important to remember that technogenic factors affect life.

Conclusion. The impact of technogenic factors on agroecosystems is a global environmental problem. It negatively affects the physiological processes of plants, biological activity in the soil, productivity, animal and human health. Therefore, reducing industrial waste, strengthening environmental monitoring, introducing clean technologies and recultivating damaged areas are urgent tasks.

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