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ANALYSIS OF INTERRELATED PROBLEMS IN ENSURING GREEN TREES ENVIRONMENTALLY SECURE ECONOMY

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Abstract
In this article, the method of studying the concentration of pollutants in the atmosphere and the accumulation of these substances on the leaves of different types of trees is analyzed by modeling simple statistical relationships. According to the results of regression correlation modeling, it was found that there is a strong correlation between the concentration of harmful substances in the atmosphere and the amount of cumulation in the leaves of trees. Such a connection was especially manifested at the highest level in the juniper tree. In particular, it was determined that the density of connection between two sulfate compounds and the accumulation of this substance in the leaves of selected trees was equal to 0.88 in fir tree, 0.78 in oak tree, 0.75 in chestnut tree and 0.93 in paulownia tree.

Keywords: ecology, atmosphere, leaves, substances, trees, pests, urban, dependence, linear, regression, correlation, chlorophyll.

Introduction

Pollutants in the atmosphere affect the living organism in the form of biochemical agents, causing disturbances in the ultramicroscopic structure of the cell. This leads to physiological processes and metabolism of plants, and causes a decrease in its productivity and growth rate, life expectancy. In an ecosystem, depending on the genetic characteristics of trees, the effects of different types and levels of pollutants on them can be different. The stress level of atmospheric substances on trees develops in two cases, such as the amount in limited time intervals or the accumulation over a long period of time.

As a result of industrial or other types of anthropogenic substances released into the atmosphere, their concentration undergoes changes and accumulation in soil and plant cover is observed in certain areas. Research in this direction was first conducted by McLaughlin SB [1] in the 80s of the last century. During these times, sulfate dioxide was considered the main air pollutant in Europe and America, as well as in the former Soviet Union. The fact that the first joint scientific project of Soviet and American scientists in the 1980s was devoted to the forest ecosystem and the effects of pollutants shows how

problematic the effects of substances on trees were during this period [175]. To date, research in this direction is carried out on a large scale and specific to each region. By the end of the last century, acid rain appeared, one of the main threats to the ecosystem of trees. Although the occurrence of acid rain was observed in the Middle Ages, today the scale of anthropogenic changes, the concentration of industrial and household waste in the atmosphere has become dangerous, which has led to an increase in the intensity of acid rain [183].

Based on the results of the conducted research, with the increase of pollutants in the atmosphere, the ecosystem of trees in the forest region of the world has lost its viability by 45% [184]. Today, in the study of changes in trees in the world, a method of diagnosis and classification based on changes in tree morphology consisting of 12 points is applied [177]. The purpose of this research work is to study the relationship between the accumulation of pollutants in trees under the conditions of the concentration of pollutants in the atmosphere in Andijan city.

Research Methodology

The method of studying the accumulation of these substances on the leaves of different types of trees with the concentration of pollutants in the atmosphere in the studied area is to analyze simple statistical relationships by modeling. For this, the correlation relationship between the two studied variables was determined and reliability was evaluated.

The determined concentration of harmful substances in the atmosphere was determined using the analysis of samples taken from tree leaves at the same time. In such conditions, it will not be possible to determine the intensity of cumulation . The reason is that harmful substances in the atmosphere accumulate on tree leaves at certain time intervals.

The correlation analysis is based on the straight- line recreation equation:

$$y_x = a_0 + a_1 x$$

Here parameter a1 is called the regression level and it represents the effectiveness of the factor indicator or, conversely, the degree of reduction, that is, how much the resulting variable increases when the value of this indicator increases by one unit. Based on this linear equation, the correlation density of changes in the amount of substances in tree leaves with the increase in the concentration of harmful substances in the atmosphere was determined using the correlation coefficient:

$$r_{xy} = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}}$$

the bond density is in the range of ±0.3 0.5 , the bond is weak; If it lies between ±0.5 and 0.8, the bond is average; If it lies between ±0.8 and 1.0 , the connection is considered strong [178]. During the correlation analysis, a 95% confidence interval was chosen to determine the reliability between the mean and the variance [2].

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The obtained results and their discussion

The atmosphere is a practically unbounded air phase , and the physical and chemical processes in it are important for living organisms. The presence of anthropogenic harmful substances in the air space and its concentration have a secondary, first of all, harmful effect on the person [181]. This effect is manifested on trees in hidden, regular and irreversible forms. The effect in low concentration, in turn, does not give a quick sign in plants and disrupts physiological processes. If the regular exposure adversely affects the process of chlorophylls, the concentration of substances in the atmosphere in an irreversible form starts to destroy the tree itself due to the inability of the tree stem to absorb water with the process of mesophytization or unusual shedding of leaves.

According to the results of studies, if the limit of resistance of trees to such substances does not exceed the level of their adaptation characteristics, it cannot have a harmful effect on the ecosystem of trees. Such a concentration limit was expressed in the same indicators as in 1984 . The maximum indicator of NO2 in the atmosphere is a maximum of 0.04 mg for each cubic air environment, an average of 0.02 mg per day; The maximum level for lead is 0.01 mg, the daily average is 0.002 mg, and the maximum for SO2 is 3.0 mg. daily maximum of 1.0 mg; for formaldehyde, the maximum limit is 0.02 mg, the average daily limit is 0.003 mg (Table 1).

Table 1 Permissible concentration of harmful substances in the atmosphere on the effect on tree cover [4]

Substances	In the atmosphere concentration , **mg / m 3**	
	Maximum level	Average daily
NO2	0.04	0 .0 2
Pb	0.01	0.002
SO2	3.0	1. 0
Formaldehyde	0. 0 2	0.003

According to the results of regression correlation modeling, it was found that there is a strong correlation between the concentration of harmful substances in the atmosphere and the amount of cumulation in the leaves of trees. Such a connection was especially manifested at the highest level in the juniper tree.

In particular, the correlation density between sulfate dioxide and accumulation of this substance in the leaves of selected trees was equal to 0.88 in fir tree, 0.78 in oak tree, 0.75 in chestnut tree and 0.93 in paulownia tree. (You can see the reliability of this correlation equation in graph 1 point a).

Parameters of the regression model equation between harmful substances in the atmosphere and their amount in tree leaves (the dependence of atmospheric SO2, Pb, NO2, Formaldehyde on the amount of four tree leaves was studied in the modeling).

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The parameters between harmful substances in the atmosphere and their amount in tree leaves depend on the amount of atmospheric SO_2, Pb, NO_2, Formaldehyde in the leaves of four types of trees

2 - table

Indicators	Linear	Correlation coefficient
SO_2		
Juniper tree	SO2 = -0.07730+46.68814* Fir tree (mg / kg)	0.82
Oak tree	SO2 = 0.21984+59.87591* Oak tree (mg / kg)	0.78
Chestnut tree	SO2 = 0.16420+29.36898* Chestnut tree (mg / kg)	0.75
Paulownia tree	SO2 = 0.13524+40.40275* Paulownia wood (mg / kg)	0.93
Pb		
Juniper tree	Pb = 0.00040+0.10578* Fir tree (mg / kg)	0.26
Oak tree	Pb = 0.00149-0.07229* Oak tree (mg / kg)	0.009
Chestnut tree	Pb = 0.00254-0.64074* Chestnut tree (mg / kg)	-0.38
Paulownia tree	Pb = 0.00047+0.35000* Paulownia wood (mg / kg)	0.02
NO_2		
Juniper tree	NO2 = 0.01750+2.33779* Fir tree (mg / kg)	0.95
Oak tree	NO2 = 0.02509+2.35516* Oak tree (mg / kg)	0.94
Chestnut tree	NO2 = 0.33119-2.25072* Chestnut tree (mg / kg)	-0.08
Paulownia tree	NO2=0.05545+4.00437* Paulownia tree (mg / kg)	0.80
Formaldehyde		
Juniper tree	Formaldehyde = 0.00631+42.25027* Spruce (mg/kg)	
Oak tree	Formaldehyde = 0.00631+42.25027* Oak tree (mg / kg)	0.78
Chestnut tree	Formaldehyde = 0.00948+32.48659* Oak tree (mg / kg)	0.53
Paulownia tree	Formaldehyde =0.00904+14.17263* Chestnut tree (mg / kg)	0.71
Paulownia tree	Formaldehyde =0.01177+15.13008* Paulownia wood (mg / kg)	0.62

The peculiarity of the transformation of sulfate dioxide is that it is oxidized in the atmosphere, and from sulfate to its other compounds, it accumulates strongly in trees. Its oxidation practically takes place in two ways: firstly, the gaseous facade meets with strong oxidants for a homogeneous reaction by photochemical means (hydroxide process); secondly, absorption of water vapor in heterogeneous, i.e. clouds, fog and other types of precipitation. In both cases, its excess over the permissible rate causes the development of irreversible negative processes for trees. In addition, sulfate dioxide is a toxic substance with strong absorption properties.

Accumulation of lead from heavy metals in tree leaves causes the development of two types of harmful processes. Firstly, it has a harmful chemical effect, destroys the process of chlorophyll, and secondly, it accumulates in the leaves and participates in the process of thermal burning. According to modeling results, the coupling strength between atmospheric concentration and tree leaf accumulation is weak. Even cumulation in the leaves of the chestnut tree showed the presence of an inverse relationship (table 2, clause).

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Correlation between nitrogen dioxide in the atmosphere and cumulation in tree leaves showed a correct and strong correlation in fir, oak and paulownia trees, and a weak correlation with chestnut tree. The maximum concentration of nitrogen dioxide in the atmosphere up to 0.04 mg/m3 is important for nitrogen saturation of trees.
Formaldehyde is one of the most harmful chemicals, its concentration higher than 0.02 mg/m3 causes the death of cells in the leaves of trees and the spread of the necrotic process. A concentration above this limit has been observed to develop even after exposure for 10 minutes [182]. It was found that there is an average relationship between the concentration of formaldehyde in the atmosphere and its amount in tree leaves (Graph 1 point d).

Summary

In the city of Andijan, it was found that there is a linear relationship between the accumulation of harmful substances in the atmosphere in the leaves of existing tree species isolated for research. The highest accumulation of harmful substances was observed in the leaves of the juniper tree, while the lowest index corresponded to the chestnut tree. Based on the results of the analysis, the chestnut tree can be called the cleanest ecological tree. The highest association between pollutants was attributed to nitrogen oxide, while the lowest association was attributed to lead . It was found that the lead substance in the leaves of the chestnut tree is inversely related to the concentration of this substance in the atmosphere. The conducted research was aimed at determining the linear relationship between the concentration of harmful substances detected in the atmosphere and the cumulation in tree leaves, and this relationship was proved.

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