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EFFECTS OF HIGH VOLTAGE POWER LINES ON MICROMYCETES

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Abstract. *During restoration work scientific research in the field of the effect of EMF on soils and living organisms is relevant. Using the classical analysis of variance and nonparametric dispersion analysis of experimental data, the statistical significance of the cumulative effect of the remoteness of power lines and seasonality on the change in the number of aerobic microorganisms was established. Two-sided analysis of variance demonstrates the influence of high-voltage power lines on the change in the number of microalgae, and, as a result, on soil properties.*

Any military action is accompanied by such emergency situations (ES) as the collapse of elements of transport communications and industrial buildings and structures; accidents at autonomous power plants, in sewer systems with massive emissions of pollutants, in heating networks, in wastewater treatment plants of industrial enterprises, etc. The consequences of these ES are destroyed small and large settlements, polluted air, water and soil, which requires significant restoration work. In particular, agricultural soils of Ukraine are intended to provide the population of their own country and other countries with food and their condition must be controlled under various conditions to maintain food security. Every day, living organisms are exposed to various types of electromagnetic pollution.

Although it should be noted that the opinions of researchers on the impact of electromagnetic pollution on living organisms are divided. This is due to the fact that earlier studies rather ambiguously indicated either a negative or a positive, and sometimes even a neutral effect of electromagnetic fields and/or electromagnetic radiation [1]. About 60% of them did not report negative effects of these fields, while the remaining 40% reported some lesser or greater negative effects [2]. It has been established that the effectiveness of the impact of millimetre radiation on the biosynthesis of enzymes and development cycles of micromycetes depends both on the physical parameters of irradiation and on the properties and functional state of producer strains [3]. Therefore, in order to conduct biomonitoring to study the ecological state of agricultural lands, as a test system that is exposed to EMF, biological organisms can be selected.

Using the STATGRAPHICS Centurion XVI software with the statistical data processing methods implemented in it, the following was obtained. The detailed analysis of experimental data made it possible to distinguish two zones that differ in the change in the number of aerobic microorganisms: the near one, the distance of which is no more than 300 m from the PL, and the remote zone, more than 300 m (Figure 1 and 2). Figures 1 and 2 clearly demonstrate that in the near zone ($L < 300$ m) the process of changing in the number of aerobic microorganisms is unstable and is established only in the remote zone ($L > 300$ m). Consequently, in the remote zone ($L > 300$ m), the process of changing the number of aerobic microorganisms stabilizes, which makes it possible to apply the methods of regression analysis for further research.

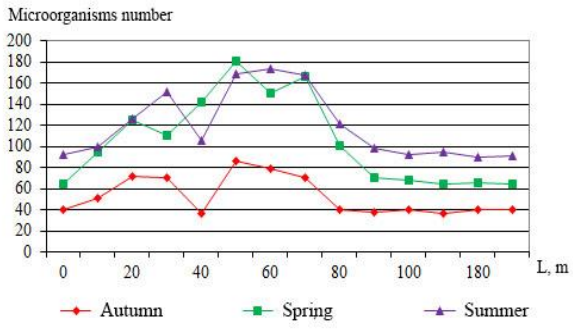

Fig. 1
The aerobic microorganisms number change depending on the distance in the near zone at different times of the year

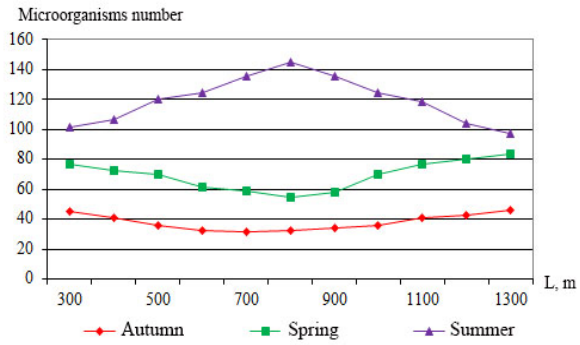

Fig. 2
The aerobic microorganisms number change depending on the distance in the remote zone at different times of the year

According to [4], to test the hypothesis and confirm the absence of contradictions, the test can be carried out according to the formula

$$PV = 1 - \prod_{i=1}^{k} (1 - Pv_1); \text{ i} = 1, 2, \ldots, \text{k} \qquad (3)$$

where PV is final value Pv; Pv_1 is value for each of the criteria used.

$$PV \approx 0 << 0.05,$$

The results of classical and nonparametric ANOVA confirmed the conclusions stated above, namely combined influence of the two factors is indeed significant.

Since active changes in physicochemical and biological processes in the soil are observed during the change of seasons and stable weather conditions, the electrophysical characteristics of the soil and the nature of its interaction with the electromagnetic fields of power lines change. Therefore, to understand the ongoing changes, a cluster analysis was carried out. In this case, each observation in the near zone was considered as a multidimensional vector, the coordinates of which correspond to the seasons.

It was found that the resulting clusters differ significantly in their average values. The reasons for such a large difference require further study.

Since fertile soils are the basis for maintaining food security in the country and in the world, it is necessary to study the influence of power lines on the dynamics of the distribution of the number of microorganisms. Mathematical modelling of these processes can form the basis of biomonitoring for the development of technologies for protecting agricultural land from electromagnetic pollution.

Used information sources:

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