THE COMPARATIVE RESEARCH OF THE EFFICIENCY OF BIOMETHODS AND CHEMICAL METHODS OF WATER MONITORING

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The goal of our research is to provide people with a reliable ecological assessment of several water objects condition by the method of bioindication, to compare this method to a traditional one, based on water chemical analysis and to monitor the dynamics in the changes of the level of negative impact of human activities on the environment of the city.

Keywords: water monitoring, bioindication, water pollution, correlation analyses, organisms-bioindicators.

The most well-known methods of water monitoring are bioindication and a chemical method. They both solve a number of problems. Environmental monitoring is a system of supervision over the condition of the environment .The method of bioindication has its pros and cons, but we have met statements in literature about unreliability and inaccuracy of the data received by means of bioindication. These aspects became the reason of the topic of our research.

It has been hypothesized about the possibility of obtaining reliable data on water pollution with the help of different methods of bioindication.

The purpose of the research is to carry out an ecological estimation of the condition of several water objects and to study comparative efficiency of the methods of monitoring. There are 2 main ways to study the state of a water object:

One of them is water pollution index determination, which is based on the evaluation of water quality by chemical methods. In our project the water pollution index was determined according to official data of the Ministry of Natural resources.

Also the state of the reservoir can be studied by bioindication. Biotesting is a method of evaluation of the degree of pollution of the natural environment with the help of living organisms.

In our research we used 2 methods of bioindication.

Mayer Method is based on the fact that certain organisms inhabit reservoirs with the certain degree of impurity.

Vassman and Xilander Method is based on the estimation of the quality of the river water with the help of the specific variety of water organisms.

Researches (presented in our work) took place in May – October 2017. In Mogilev region,the researches were conducted during the summer expedition in 2017. On other control points they were conducted in after-school time.

It was interesting for us to check the reliability of the data obtained as a result of bioindication, but in order to prove or refute the statements found in the literature about their inaccuracy, it was necessary to compare the obtained results of bioindication with the data on the chemical analysis of the studied water objects. As we did not have professional chemical equipment, and the analysis of one sample of water in a chemical laboratory costs about 30 dollars, we used data on chemical pollution of water objects of Belarus, which were given in the annual environmental Bulletin of the Ministry of Natural Resources of the Republic of Belarus.

In our researches we carried out the bioindication of the animals living at the bottom, in thrickets of water vegetation and floating in water thickness. To catch them we used a net and special devices.

We selected minimum 5 tests from each spot.

In our researches we used Mayer technique and Vassman and Xilander technique. They fit any types of reservoirs. Using the method of Mayer, organisms – indicators were classified to one of the three sections submitted in the table.

In our researches, we studied the state of water at six water objects that are located in the regions with different industrial and anthropogenic loads. After calculating the results of the methods of bioindication and collecting the literature data about chemical pollution of water objects, we summarized the data in the table.

The conducted researches have shown, that the highest quality of water according to all the methods can be found in the river Ol'sa and the river Drut'. This is the area with the lowest anthropogenic load.

The dirtiest was the river Svisloch'. Thus the quality of water in the river was found reducing downstream. The dirtiest water characterized the river Svisloch' in the area of Shabany (on the way out of the city).

These conclusions were approximately identical according to the results of both techniques of bioindication and proved to match with the data of IPW.

One of the tasks of our researches was to define the comparative efficiency of the methods of bioindication and also to compare them to the standard method, based on IPW. It is possible to establish reliability of the received results only by mathematical methods therefore we carried out statistical data processing. Correlation analyses were carried out to solve this problem. We compared the methods of bioindication between each other and also each of this methods with the water pollution index. As you can see, in all three cases, the correlation coefficient was as close as possible to 1.

The results of our work confirmed our hypothesis that it is possible to obtain reliable data on water pollution using several different methods of bioindication.

Thus, from the results of our work, we can make the following conclusions:

The carried out researches of the impurity of water objects of Belarus by methods of bioindication have shown, that the best situation is on the rivers Ol'sa and Drut'.The dirtiest river is the river Svisloch'. That confirms the dependence of water pollution on economic activities of man because the quality of water in Svisloch' obviously degrades downstream.

1. The Statistical correlation analysis has shown a high level of comparability of techniques of bioindication according to Mayer and Vassman and Xilander methods.

2. The comparison of the results of bioindication with the literary data on water objects pollution (IPW) confirms their high comparability.

According to the results of our work it can be concluded that both of the methods of bioindication - the method of Mayer and the method of Wassman and Xilander can be effectively used to monitor water objects and obtain reliable data on their environmental condition along with traditional chemical methods of analysis.

INVESTIGATION OF TOXIC AND GENOTOXIC EFFECTS OF SYNTHETIC FOOD DYES BY THE ALLIUM TEST METHOD

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The study of the influence of food dyes using the method of Allium test. Evaluation of toxic, mitosis-modifying and mutagenic action of the factor.

Keywords: Allium test, ana-telophase analysis, food dyes, mitotic index, mutagens, chromosome aberrations.

The nutritional factor is one of the most important factors that influence the state of human health and its population as a whole.Food is not only a carrier of plastic and energy materials, but also a source of components of non-alimentary (non-food) character, among which there are many components of anthropogenic origin.The most important group of such foreign food substances is a huge amount of food additives.One of the most common types of food additives can be considered a group of dyes.In its composition, dyes contain components of animal and vegetable origin, as well as some minerals and salts.To give different shades to products, manufacturers use dyes both natural (of natural origin) and synthetic (of organic and inorganic nature).

The relevance of the study of food additives as one of the factors affecting humans, causes the prevalence of malignant diseases, allergies and other pathologies.

Objective: to study the toxic, mitosis-modifying and mutagenic effects of various synthetic food dyes using the Allium-test method.

The tasks that need to be addressed include:

– To study the spontaneous level of mitotic index and chromosomal aberrations, as well as the length of the roots in the Allium cepa meristem.

– To reveal the mitosis-modifying effect of food colorings.

– Evaluate the mutagenic effect of fooddyes .

Material of a research were food dyes. Food dyes: orange (Yellow "Sunset" – E110), yellow (Tartrazin – E102), green (Green S – E142), blue (Diamond Blue FCF – E133).

The object of the study in this test is the meristems of seedlings of the roots of onion – Allium cepa of the Stuttgart-Riesen variety.