

Determination of acute toxicity of drink-ing water by means of bio-tests

The purpose. To determine acute toxicity of drinking water by means of bio-tests on an onion and a fish *Mollienesia*.

Methods. The conventional bio-test on a root system of an onion and additional determination of an index of amount of the developed roots. The bio-test on aquarium fishes *Mollienesia* fixed surviving and ethological modifications.

Results. Indexes of biotesting plants of onion in test-groups were above, than that ones in control because of the distillate which deprived not only toxic substances, but also useful elements, that is not favorable for alive entities. At testing on *Mollienesia* half of fishes in test-groups died, whereas in control this index was 37,5%.

Conclusions. Water of test-groups was more toxic in comparison with control in the beginning of experiment as within the first day half of fishes has died. In control group the mortality was also observed, but later, and it was lower. At determination of growth and development of root system of an onion it is fixed that distillate is not the best control for biotesting.

Key words: bio-testing, test-organism, quality of water, acute toxicity.

Formulation of the problem. Monitoring of drinking water quality is one of the most important problems of modern society. The anthropogenic pressure on the environment increases annually, the number of new toxicants, which can not be detected at the time of the chemical analysis of water, is constantly increasing, not only the inflow of harmful substances. Therefore, biotesting as an alternative to complex methods for determining the quality of water becomes of great importance. Biotesting gives an opportunity to evaluate the overall toxicity of the test sample. Specific reaction of test organisms to the action of a specific component is revealed in certain, established in practice concentration limits. Therefore, it is necessary to choose the optimal precisely for this object test organism, which will be both convenient and as informative as possible. Absolutely different types of organisms are used. The first method of biotesting of water quality was proposed by M.K. Chermak and I.M. Arnold in the late nineteenth century. The fish survived in experimental water (fish sample) [5]. Known techniques that employ insects [6], different species of fish [2]. According to the taxonomy developed by M.O. Shalimov, as a rule, apply certain characteristics, according to the belonging to the class of living beings, investigated features. For example, for fish - ethological indicators, the intensity of respiration, pigmentation [6]. The use of fish of the guppies (*Poecilia reticulata* Peters) and the data (*Brachydanio rerio* Hamilton-Buchanan) for testing drinking water has become widespread [2]. Various types of organisms can be used simultaneously to obtain more complete information on the quality of water and its effects on living creatures [4]. Thus, the publication of research VV Goncharuk and VV Akhripchuk regarding the results of biotesting of bottled drinking water attracted the attention of Ukrainian and foreign scientists. After all, it was found that of the 30 samples of tested water 71% were gnotoxic, only 3 of them

were safe [3]. Plants are also used to determine the quality of drinking water. For example, the Swedish scientist G. Fiskesjo at the end of the last century proposed a common method of testing onions. In some experiments, the mass of the root system is established [8, 9]. The above determines the relevance of the study of the use of biotesting as alternative complex methods for monitoring the quality of drinking water. The purpose of the research is to determine the acute toxicity of drinking water for the use of bite onion and fish of molinisia. Materials and methods. A biosensor battery was formed to provide more informative research. Used onion and molluscan fish. The research of water quality for drinking needs of the population was carried out at the Communal enterprise "ZhytomyrVodokanal". Sampling was carried out in July 2013. Two research groups were formed. Water was taken from clean water reservoirs (PWRs), which the city uses for its own needs. There are 2 such reservoirs (RSV1 and RSV2) at the Communal enterprise "ZhytomyrVodokanal" - respectively, the experimental groups I and II. The volume of the first one is 5,000 m³, filtration is used for water purification, the second volume - 20,000 m³, coagulation is used.

Control was distilled water. Testing was carried out on the standard crop of the Centurion according to the generally accepted method [8, 9]. Each group had 10 bulbs immersed in the experimental water. Duration of bioassay - 7 days. At the end of this term, the number of formed roots and the length of the root beam were determined. Fish testing was carried out in accordance with the standardized method of biotesting in Ukraine [1]. On fish molinists, biotesting lasted for 4 days. There were 8 fish for each group. The volume of selected samples is 3 liters. Everyday mortality, fatal time and ethological indicators were determined: smooth movements, vector movements, state of real estate, contact with other fish, glass beating, locomotive movements, circular movements. Time of observation of fish behavior was 3 minutes for each fish. We established the average share of one or another fish behavior during the observation. Research results. Test results on onion are determined (Table 1). These data indicate that both indicators (number of roots and root canal length) have the best results in experimental group II, and the worst in the control group. Therefore, we believe that the results of testing are influenced not only by the presence of toxic substances in water, but also the lack of useful substances that have been removed during distillation. The results of testing on fish of molinisia are determined (Table 2). Although the mortality of the fish in the control group was the least significant, the fact of its fact in the control group indicates that dystilyate is not the optimal control for determining the quality of water. The time of smooth movements is the most characteristic for swimming fish under normal conditions. In our studies, it has been established that it has been steadily declining in all groups. So, if one day after the experiment began, the average time of smooth movements in the experimental groups I and II was 37.37 and 40.30%, then in the control - 36.7% of the total observation time. At the end of the experiment, this indicator was at 13,40 and 12,85% for experimental groups and 12,61% for control. Real estate has been steadily increasing, displacing the amount of time movements on the spot. If in the beginning of the experiment, the time of movements in place was 45.15% of the total time, and the real estate time - 29.13%, then at the end of the experiment, these indicators were respectively 63.17 and 9.06%. In the research groups, the real estate index is 18.74 and 25.80% of the total time, and at the end of the experiment - 17.12 and 36.82% respectively. The index of the beating of fish about glass began to appear on the 2nd day in the experimental groups and amounted to 12.87 and 1.06%, and for the 3rd day - 4.13 and 6.62% respectively.

Conclusions

Samples from clean water reservoirs (experimental groups) are more toxic than controls. Thus, during the first day half of the fish died, then no mortality was. In control, mortality was also observed and in 48 hours, 37.5% of fish

perished. The activity of fish in all groups at the end of the experiment decreased, and the lowest was on the control. In determining the growth and development of the onion root system, the control group's rates were lower than in the experimental groups. Consequently, distilled water is not the best benchmark for biotesting. The standard may be water that does not contain harmful substances and at the same time is not deprived of elements useful for living beings.

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