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«ХАЛЫҚ» ЖҚ

ХАБАРЛАРЫ

ИЗВЕСТИЯ

РОО «НАЦИОНАЛЬНОЙ
АКАДЕМИИ НАУК РЕСПУБЛИКИ
КАЗАХСТАН»
ЧФ «Халық»

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NAS RK is pleased to announce that News of NAS RK. Series of geology and technical sciences scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of News of NAS RK. Series of geology and technical sciences in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential content of geology and engineering sciences to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы «ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы» ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Webof Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді геология және техникалық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия геологии и технических наук» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Известия НАН РК. Серия геологии и технических наук в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по геологии и техническим наукам для нашего сообщества.

ЧФ «ХАЛЫҚ»

В 2016 году для развития и улучшения качества жизни казахстанцев был создан частный Благотворительный фонд «Халык». За годы своей деятельности на реализацию благотворительных проектов в областях образования и науки, социальной защиты, культуры, здравоохранения и спорта, Фонд выделил более 45 миллиардов тенге.

Особое внимание Благотворительный фонд «Халык» уделяет образовательным программам, считая это направление одним из ключевых в своей деятельности. Оказывая поддержку отечественному образованию, Фонд вносит свой посильный вклад в развитие качественного образования в Казахстане. Тем самым способствуя росту числа людей, способных менять жизнь в стране к лучшему – профессионалов в различных сферах, потенциальных лидеров и «великих умов». Одной из значимых инициатив фонда «Халык» в образовательной сфере стал проект Ozgeris powered by Halyk Fund – первый в стране бизнес-инкубатор для учащихся 9-11 классов, который помогает развивать необходимые в современном мире предпринимательские навыки. Так, на содействие малому бизнесу школьников было выделено более 200 грантов. Для поддержки талантливых и мотивированных детей Фонд неоднократно выделял гранты на обучение в Международной школе «Мирас» и в Astana IT University, а также помог казахстанским школьникам принять участие в престижном конкурсе «USTEM Robotics» в США. Авторские работы в рамках проекта «Тәлімгер», которому Фонд оказал поддержку, легли в основу учебной программы, учебников и учебно-методических книг по предмету «Основы предпринимательства и бизнеса», преподаваемого в 10-11 классах казахстанских школ и колледжей.

Помимо помощи школьникам, учащимся колледжей и студентам Фонд считает важным внести свой вклад в повышение квалификации педагогов, совершенствование их знаний и навыков, поскольку именно они являются проводниками знаний будущих поколений казахстанцев. При поддержке Фонда «Халык» в южной столице был организован ежегодный городской конкурс педагогов «Almaty Digital Ustaz.

Важной инициативой стал реализуемый проект по обучению основам финансовой грамотности преподавателей из восьми областей Казахстана, что должно оказать существенное влияние на воспитание финансовой грамотности и предпринимательского мышления у нового поколения граждан страны.

Необходимую помощь Фонд «Халык» оказывает и тем, кто особенно остро в ней нуждается. В рамках социальной защиты населения активно проводится

работа по поддержке детей, оставшихся без родителей, детей и взрослых из социально уязвимых слоев населения, людей с ограниченными возможностями, а также обеспечению нуждающихся социальным жильем, строительству социально важных объектов, таких как детские сады, детские площадки и физкультурно-оздоровительные комплексы.

В копилку добрых дел Фонда «Халык» можно добавить оказание помощи детскому спорту, куда относится поддержка в развитии детского футбола и карате в нашей стране. Жизненно важную помощь Благотворительный фонд «Халык» оказал нашим соотечественникам во время недавней пандемии COVID-19. Тогда, в разгар тяжелой борьбы с коронавирусной инфекцией Фонд выделил свыше 11 миллиардов тенге на приобретение необходимого медицинского оборудования и дорогостоящих медицинских препаратов, автомобилей скорой медицинской помощи и средств защиты, адресную материальную помощь социально уязвимым слоям населения и денежные выплаты медицинским работникам.

В 2023 году наряду с другими проектами, нацеленными на повышение благосостояния казахстанских граждан Фонд решил уделить особое внимание науке, поскольку она является частью общественной культуры, а уровень ее развития определяет уровень развития государства.

Поддержка Фондом выпуска журналов Национальной Академии наук Республики Казахстан, которые входят в международные фонды Scopus и Wos и в которых публикуются статьи отечественных ученых, докторантов и магистрантов, а также научных сотрудников высших учебных заведений и научно-исследовательских институтов нашей страны является не менее значимым вкладом Фонда в развитие казахстанского общества.

С уважением,
Благотворительный Фонд «Халык»!

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Khoja Akhmet Yassawi International Kazakh-Turkish University,
Turkistan, Kazakhstan.
E-mail: *abylayhan.azimby@mail.ru*

DETERMINATION OF THE DEGREE OF PURIFICATION OF WATER CONTAMINATED WITH HEAVY METAL IONS BY DAPHNIA

A.I. Azimbay — Master of science, lecturer at Khoja Akhmet Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
E-mail: *abylayhan.azimby@mail.ru*. ORCID: https://orcid.org/0000-0003-2315-0653;
T.M. Karimzhan — Master of science, lecturer at Khoja Akhmet Yassawi International Kazakh-Turkish University, Turkistan, Kazakhstan
E-mail: *toleu.karimzhan@ayu.edu.kz.* ORCID: *https://orcid.org/0000-0002-3461-1876*.

Abstract. In almost all major cities of the country, urban and industrial waste water is combined and then sent to biofilter facilities. Biological methods for cleaning accumulated waste water are currently one of the most important. Cleaning with this method is characterized by fast and low cost. In this article, effective methods for cleaning water contaminated with heavy metal ions by biotesting were developed and the degree of water purification by Daphnia was determined. In addition, in this Biotest, Daphnia was proposed to be used in practice, distinguished by its high sensitivity to toxic metal ions. Daphnia's life in different environments and its physiological characteristics have been determined. The results of the research work using various devices and devices were more accurate and accurate.

Keywords: heavy metal ions, water purification, Daphnia, biotesting, degree of water pollution, filtration

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Қожа Ахмет Ясауи атындағы Халықаралық қазақ-түрік университеті,
Түркістан, Қазақстан.
E-mail: *gani.isayev@ayu.edu.kz*

DAPHNIA АРҚЫЛЫ АУЫР МЕТАЛЛ ИОНДАРЫМЕН ЛАСТАНҒАН СУДЫ ТАЗАЛАУ ДӘРЕЖЕСІН АНЫҚТАУ

А.И. Әзімбай — магистр оқытушы, Қожа Ахмет Ясауи атындағы Халықаралық қазақ-түрік университеті, Түркістан, Қазақстан
E-mail: *abylayhan.azimby@mail.ru*. ORCID: *https://orcid.org/0000-0003-2315-0653*;

Т.М. Кәрімжан — магистр оқытушы, Қожа Ахмет Ясауи атындағы Халықаралық қазақ-түрік университеті, Түркістан, Қазақстан
E-mail: *toleu.karimzhan@ayu.edu.kz*. ORCID: https://orcid.org/0000-0002-3461-1876.

Аннотация. Еліміздің барлық дерлік ірі қалаларында қалалық және өндірістік қалдық сулар бірігіп, одан ары қарай биосүзгілеу нысандарына жіберіледі. Жинақталған қалдық суларын тазалаудың биологиялық әдістері қазіргі таңда маңызды әдістердің бірі болып табылады. Аталмыш әдіс арқылы тазалау жылдам әрі шығыны аздау болуымен сипатталады. Бұл мақалада ауыр металл иондарымен ластанған суды биотестілеу арқылы тазалаудың тиімді әдістері жасалып, дафния арқылы суды тазалау дәрежесі анықталды. Сонымен қатар, бұл биотестте дафния улы метал иондарына жоғары сезімталдылығымен ерекшеленіп, тәжірибеде қолданылу ұсынылды. Дафнияның түрлі орталар да тіршілік етуі мен оның физиологиялық ерекшеліктері анықталды. Ғылыми-зерттеу жұмысы түрлі қондырғылар мен приборларды пайдалану арқылы нәтижелері нақты әрі дәлді болды.

Түйін сөздер: ауыр металл иондары, суды тазалау, дафния, биотестілеу, судың ластану дәрежесі, сүзгілеу

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Международный казахско-турецкий университет имени Ходжи Ахмеда Ясави, Туркестан, Казахстан
E-mail: *gani.isayev@ayu.edu.kz*

ОПРЕДЕЛЕНИЕ СТЕПЕНИ ОЧИСТКИ ВОДЫ ЗАГРЯЗНЕННОЙ ИОНАМИ ТЯЖЕЛЫХ МЕТАЛЛОВ С ПОМОЩЬЮ DAPHNIA

Азимбай А.И. — магистр, преподаватель, Международный казахско-турецкий университет имени Ходжи Ахмеда Ясави, Туркестан, Казахстан.
E-mail: *abylayhan.azimby@mail.ru*. ORCID: *https://orcid.org/0000-0003-2315-0653*;
Каримжан Т.М. — магистр, преподаватель, Международный казахско-турецкий университет имени Ходжи Ахмеда Ясави, Туркестан, Казахстан
E-mail: *toleu.karimzhan@ayu.edu.kz*. ORCID: https://orcid.org/0000-0002-3461-1876.

Аннотация. Практически во всех крупных городах страны городские и промышленные сточные воды объединяются и направляются на объекты биофильтрации. Биологические методы очистки накопленных остаточных вод являются наиболее важными в настоящее время. Очистка с помощью данного метода характеризуется тем, что она более быстрая и менее затратная. В статье были разработаны эффективные методы очистки воды, загрязненной ионами тяжелых металлов, путем биотестирования и определения степени очистки с помощью дафнии. В этом биотесте дафния отличалась высокой чувствительностью к ионам токсичных металлов и, следовательно, предлагалась к применению на практике. Установлены различные среды обитания дафнии и ее физиологические особенности. С использованием различных установок и приборов удалось достигнуть точных результатов научно-исследовательской работы.

Ключевые слова: ионы тяжелых металлов, очистка воды, дафния, биотестирование, степень загрязнения воды, фильтрация

Introduction

The problem of protection of surface and underground water sources from pollution is determined depending on the amount and level of toxicity of urban and industrial waste water discharged into them in a particularly large Mashtab. For this purpose, the types of impurities in natural water and their environmental effects on hydrobionts must first be determined. Because according to the regulatory requirements for natural water sources, water quality should ensure the balance of the ecosystem in it. More precisely, this means that the purity of water is achieved by the result of the life of hydrobionts in it. In this regard, it should be noted that the ecological system of natural water sources should be considered not individually, but taking into account the effects of urban and industrial waste water added to it.

In many countries, a sharp increase in the population, combined with the destruction of many natural ecosystems, has led to an increase in the consumption of Water Resources. Water reserves and resources necessary both for the functioning of industry and for human existence are one of the most important minerals for many countries (Sharipov, Kireeva, 2023).

Water is a habitat for many living things (water pollution of the environment and agriculture with waste from industrial production often leads to the mass death of living organisms. In turn, the death of such an entire group of organisms is caused by one extreme change in the physical and chemical parameters of the external environment, which can lead to the complete disappearance of organisms living in water. In this regard, in order to accurately predict changes occurring in the ecosystem, it is important to conduct biotesting of natural water sources, conduct environmental monitoring and protect the natural environment using them (Daribayev et al., 2008). This is due to the fact that other methods do not allow assessing the biological effectiveness of water and reservoir pollution, and since they cannot determine the result of exposure to toxic substances entering the water, it is not effective to control the quality of natural and drained water using a hydrochemical method. The level of water pollution in the country is determined by chemical and bacterial indicators. Among them, in a number of countries (USA, America, Japan), the Biotest method is used as a method of monitoring the quality of natural and drained water. It is also a component of the monitoring method of the aquatic environment and is the main indicator of the toxicity of drained water.

Currently, the method of biological indication is considered a very accurate method and allows you to assess the stage of water pollution, and other features (Alekin et al., 1973).

By studying the vital activity of natural hydrobionts closer to the natural norm, it is possible to increase the accuracy of the data provided by the biological method in assessing water quality (Alexandrova, Kanygina, 1971). But in practice, the control of natural and drained water by biotesting is used as an indicator of the quality of the aquatic environment only in individual cases. In fact, it is only in one of the methods

that some test object can be solved, based on the transformation of life into life. This is due to the fact that the Biotest method known to us still does not meet the necessary requirements for the introduction of toxic substances under control as a regulatory document (Alekseev, Lyamin, 1986).

Currently, the method of biotesting, that is, single-celled biological test organisms such as Daphnia, which show the degree of harmfulness of toxic substances, is used as an operational method for determining the toxicity of reservoirs. The problem of protection of surface and underground water sources from pollution is determined by the amount and level of toxicity of urban and industrial waste water discharged into them in a particularly large Mashtab (Olkova, Medvedeva, 2023).

The study first identified the types of impurities in natural water and their environmental effects on hydrobionts. Because according to the regulatory requirements for natural water sources, water quality should ensure the balance of the ecosystem in it. More precisely, this means that the purity of water is achieved by the results of the life of hydrobionts in it. In this regard, it should be noted that the ecological system of natural water sources should be considered not individually, but taking into account the effects of urban and industrial waste water added to it. The Daphnia test has an advantage over other biotests in its hypersensitivity to various natural poisons and is distinguished by good repeatability of the results of the experiment. Due to the toxicity of such relative chemicals for hydrobionts, it is proposed to show with Daphnia unit. In freshwater reservoirs of the former Union size, the following types of Daphnia are very common, the most important of which is Daphnia magna. They are the main source of the feed eaten by fish in the form of an important component of fresh water and make a very active contribution to the process of self-cleaning in reservoirs. The type of Scorpion, such as Daphnia magna, is quite large in size, easily gets used to laboratory conditions and is widely used by researchers. Information about the morphological and physiological features of Daphnia necessary for experiments has been published in many scientific papers (Nefedova, 2014).

When determining the quality of water in the conditions of laboratory practice, indicators such as the life of test organisms, the ways of reproduction, and the intensity of life processes are taken into account.

Waste water from production facilities is added to the waste water of all major cities of Kazakhstan and sent to special biofiltration facilities. To date, it has not studied the effect of ferric chloride, lead and zinc ions, and calcium hydrotoxic, which are often found in water compositions, on the ecosystem of natural waters. The results of this work make it possible to fill the listed gaps.

To determine the quality of waste industrial waters, industrial waste waters of the Kentau region were taken as an object of study. Until recently, the decline in the chemical quality of water was mainly limited to pollution of toxic metals, but now the greatest danger is posed by micro-impurities of various organic substances that appear in the results of agricultural activities with production processes.

The negative consequences of the eutrophication process lead to an overgrowth of phytoplankton algae in pond water, the appearance of an unpleasant smell and taste of

water, and an increase in organic matter in it. The oversaturation of water with organic matter creates conditions for the growth of saprophytic bacteria, including disease-causing bacteria and aquatic fungi. As a result of the vital activity of some algae, toxic substances are formed. Their effect is harmful to animal and sometimes human life (Isaev, 2009). To mineralize too much organic matter, most of the dissolved oxygen in the pond water is consumed. Its result is the extinction of oxidophilic animals that make up the main food source for fish.

Materials and research methods

The use of the biotesting method in the control of flowing and natural water allows us to make significant additions to the results of the chemical analysis carried out in the assessment of water quality (Table 1).

Table 1 - water quality indicators

Ingredients	Water quality indicators (indicators of dust in water. MPC= 0.01 mg\m3)	
	High pollution	Extreme high pollution
Dissolved oxygen	≤3 mg\ l	≤2 mg\l
OBKb	≥15 mg O2\l	≥60 mg O2\l
Phenols	≥0,0300 mg\l	≥0,1 ml\l
Oil products	≥15mg\l	≥5 mg\l
Chlorides	≥0,03 mg\l	≥0,1 mg\l
Other ingredients	≥=10 MPC	≥=100 MPC

It is proposed to use Daphnia as a model for biotesting individual substances in natural waters and wastewater (Charazińska, 2022). This method is based on the performances of repeated and non-repeated experiments, which last for a long time in a series of parthenogenetic generations. Assessment of the toxicity of the aquatic environment is carried out using biological characteristics: survival, fertility, reproduction and quality of offspring.

The proposed method has been developed for many years and is widely used in Environmental Protection, water toxicity testing. Currently, Daphnia is considered a means of cleaning polluted waters from fisheries waters in the former Union, and its permissible concentration (MPC) is included as a test object. In a number of countries, Daphnia is a model for determining the toxicity of substances.

The Daphnia test has an advantage over other biotests in its hypersensitivity to various natural poisons and is distinguished by good repeatability of the results of the experiment. It is proposed to indicate the toxicity of such relative toxic chemicals for hydrobionts in Daphnia units. In freshwater reservoirs of the former Union size, the following types of Daphnia are very common, and the most important of them is Daphnia magna. They are the main source of the feed eaten by fish in the form of an important component of fresh water and make a very active contribution to the process of self-cleaning in watermelons. The type of Scorpion, such as Daphnia magna, is quite large in size and easily gets used to laboratory conditions and is widely used by researchers. Information about the morphological and physiological features of Daphnia necessary for experiments has been published in many scientific papers.

The nature of the method. Cultivation and biotesting of Daphnia is carried out at a comfortable temperature of 20 + 2º C (degrees) and in daylight between 10–12 hours, without interrupting additional lamp lighting. Water for crayfish breeding is either collected from specially uncontaminated natural reservoirs or used water from a settled Aqueduct, which has been cleaned by chlorination for 7–10 days.

Green algae (chlorella) is used as feed. In order to improve algae, the following conditions must be observed: the nutrient medium Tasmiyya (Table 2) must be provided with daylight, as well as candlelight day and night and constant ventilation with atmospheric air.

Table 2-composition of the nutrient medium for the improvement of green algae

Salts	Tasmiyya medium, G\L distilled water	Uspensky middle N 1
KNO_3	5,000	0,025
KH_2PO_4	1,250	0,025
$MgSO_4 \cdot 7H_2O$	2,500	0,025
$Fe\ SO_4 \cdot 7H_2O$	0,003	-
$CaCl_2$	-	0,100
K_2CO_3	-	0,034
Micro elements	1,0	1,0

The female Daphnia crop consists of 20–30 Daphnia seedlings densely located in a 1 L medium in a glass aquarium. Aquarium water should be renewed to half once every 7–10 days. For the experiment, crayfish are bred from one separate species. Daphnia, in this case, is homogeneous, at the same age and at the same time mature, that is, it makes it possible for the experimental result not to be scattered. For this purpose, mature Daphnia are planted separately, dividing them into glasses with 100 ml of water. It is separated from the "female" part (30–40 independent species), which gave the most yields, and placed in a 2 l aquarium. In 1–3 days, the second generation is used for practice. Determination of the toxicity of water contaminated with production waste the proposed method allows you to determine the toxicity of water:

1) discharge water from individual workshops of the enterprise (conditionally clean water including;
2) water in the drain at different stages of cleaning;
3) purified water thrown into the water;
4) chemicals.

From discharged water in industry (2–3 l), a sample from the site of an open reservoir is used, which is stored in a glass container inside the freezer.

Before being discharged into the water at the last stages of cleaning, the water level of the drain is checked for toxicity or the general discharge of water in the city is checked once a week. And the frequency of repeated tests of water toxicity at each stage depends on the indicator of acute toxicity observed at the last stage. In the process of replacing technical equipment, it is necessary to check the water toxicity of drains of a new composition from the moment of preparation of the same contaminated water version. In this experiment, a variant of pure water mixed with contaminated water in a

ratio of 1:5–7 is studied. Crayfish are cooked in water that has been used to perfection. Water in which pollutants are mixed is prepared as follows: depending on the toxicity of water in which pollutants are embedded in the composition, dilution coefficients of 1:2–10 are used in their series. The toxicity of water used for experiments should be at a concentration of 10–100 mg\l. When determining the degree of water contamination, 200 ml of solution is poured into each glass and 10 Daphnia are planted, and the experiment is performed three times, each section of the experiment is carried out together with a control test. Control should be between 96 and 120 hours.

Processing and discussion of the result

1) when conducting experiments with a concentration of toxic substances in contaminated water in the range of 96–120 hours, 50 % of Daphnia conducting experiments are fatal, that is, the average, median – 50, then the concentration of water pollution has a small impact on living organisms in it;

2) percentage of death (DP 100) – the concentration of the substance in which all animals die;

3) ST 50 (ST 50, ST m) – the average survival time of 50 % in the concentration series.

The most simple and very often used method for determining the 50 DP is the graph method. In the coordinate system, a graph is constructed with a percentage of crab survival on the ordinate axis, and a logarithmic transformation of mixing (concentration) on the abscissa axis. Semi-logarithmically, this connection becomes a straight line. We draw a line parallel to the abscissa axis from the 50 % survival point along the ordinate. We draw perpendicular to the axis of the abscissa from the intersection of the point with the line. The magnitude of the SC corresponds to the sought – after DP50. The correctness of the resulting value can be determined by the following calculations. Mean squared deviation

σ = (DP84 – DP16)\2 (1) where, kiss-die percentage;

DP 84 is the concentration at which it is estimated that 84 and 16 % of crayfish die in the given period, the average statistical error is S= σ\$\sqrt{n}$ where n is the number of repetitions.

To determine the value of DP 50 by other means, you should use the “control-analysis” method.

To determine the average survival time of DP 50, a graph is also built: on the abscissa axis-time, and on the ordinate axis-survival in % for each concentration.

The discharge is determined on a four - point system by quantitative assessment of water toxicity according to Table 3.

Table 3-quantitative assessment indicators of wastewater toxicity

Quantitative assessment, with points	Life by the clock life expectancy	Toxicity price
1	Up to 20	Weak
2	Up to 10	Average
3	Up to 5	Strong
4	Smaller than 2	Very strong

The toxicity indicator of drained water is determined by its decrease with the addition of pure water to it. If the toxicity of water used in non – repeated experiments is not observed or the water toxicity is lower during 1:10 mixing, it is concluded that the toxicity of drained water is weak, and if the toxicity decreases by 10 times during mixing – then the toxicity is average, if the toxicity decreases by 100 times-then the toxicity of water in the network is high. The last group of contaminated water is considered very dangerous.

You can find out from the results of an experiment on Daphnia that SUATS are in favorable conditions for life, and there is no poison for a number of generations of Scorpions.

Experiments on Daphnia make it possible to fully, in-depth study the properties of natural water and some individual substances.

A sample of water from natural reservoirs is taken at intervals of 500 m below the place where harmful substances are thrown into it and from where they are dumped. To conduct research, the variant is mixed with a coefficient in a 2:1 ratio.

And for the study of individual substances, 3–4 concentrations of the variant are selected based on the results of non – repeated experiments: 0.2–0.5, 0.1, 0.001 and 0.0001, the conditions for conducting 50 repeated experiments in 120 hours are made similar to the above – described non-repeated experiments: constant temperature, constant light, daily food-chlorella-algae. Replacement of the solution is carried out 2–3 times a week at the rate of 50 ml of solution for each Daphnia. Changes in the biological indicator of Daphnia are made in comparison with control experiments.

In experiments for subsequent generations, the following method should be followed: during experimental control, the first offspring formed from the original species from the solution is placed in a mixed solution with a capacity of 500 ml, 10 pieces per glass, and the observation is carried out together with the original parent species. In this case, it is necessary to count the next generations in the nest and remove them. During the observation, the duration of the experiment is 30 days. During this time, the poison substance affects Daphnia's entire life, except for old age.

Indicators that can be recorded in repeated experiments are as follows: Daphnia survival, fertility, and size in each generation row.

In the process of monitoring the reproduction of crayfish, it is necessary to take into account the beginning of the time of their maturation, the registration of the period of laying eggs in the chamber (calculated in days), the time of the first exit of the young generation from the chamber (calculated in days), the number of nests, etc. The average number of young offspring in the nest can be calculated as the ratio of the number of young offspring born in the nest. The total number of offspring produced by one viable female born within 30 days represents the fertility of Daphnia and ultimately plays a crucial role in assessing the survival of that species and water toxicity.

The pathological deviation of Daphnia during reproduction and production can be traced back to its disfigured shape, dead birth and non-viable species. All these deviations are accumulated by the accuracy of the offspring and indicate the rate of reproduction of Scorpions.

Daphnia measurement can be carried out at the end of the experiments. The length of the crab is measured from the front edge of the head to the base of the Thorn, and the width – from the point of latitude of the chest. Size control experiments are performed by taking 10–15 crayfish from the sample.

The experiment (at the rate of % relative to the control sample) is carried out in the following form: during the experiment, 30 days of time – survival, the amount of offspring per 1 Daphnia in 30 days.

The results obtained are processed by the method of variational Statistics: calculates the average value and its error (x+x), calculates the coefficient of variation (V), the accuracy of the data compared to the indicator of the impact of a contaminated water sample on crabs for Daphnia, is characterized by a probability of 95 % of the Studentment coefficient.

For visualization, the survival of crayfish, by the amount of generality (time or generation to the abscissa axis, to the ordinate axis – an indicator of the solution of observation and experience), can be shown using a graph.

According to research, the criterion of Daphnia's condition, that is, a change in the rhythm of her heart contraction, depends on the toxicity indicator of the medium. The conclusion is that under normal conditions, the rhythm of Daphnia's heart rate reduction shows significant stability. Measurements have shown that the rhythm of Daphnia's heart, which has just been taken from the environment in which she grew up, is 100–150 S. and Daphnia also senses the oxygen contained in the water. If we let the air out a little, it will change the rhythm of Daphnia's heartbeat very quickly. If we send oxygen in one and not in another, the heart rate rhythm curve is in the form of a sinusoid and varies in the opposite phase up to 15 ms.

When an experiment was set up to study this phenomenon in detail, it was observed that Daphnia is also present in running water without oxygen. Despite the lack of oxygen, Daphnia's heart continues to beat in a floating position when the rhythm of her heartbeat lasts 90 minutes. Then the heart rate increases very quickly, and after 2–4 minutes the vital sign completely stops. That is, it can be concluded that in an oxygen-free environment, the work of the heart is provided with other energy resources, enough for an interval of 90 minutes. This condition is a characteristic of its own that invertebrates deserve, that is, it is observed that in some cases they go from aerobic respiration to anaerobic respiration. Table 4 below shows the chemical composition of the water bodies of Kentau.

Table 4-chemical composition of water bodies in Kentau

Parameters to be determined	Excavator plant model water №1	Galvanic water of transformer plant №2	Mine water №3	Waste water of Koskorgan Reservoir №4	SanPin 3.02.002.04
Chlorides, mg\dm3	5,83	8,66	9,5	19,9	350
Calcium, mg\dm3	48,1	77,2	58,1	110,2	-
Total iron, mg\dm3	0,029	0,022	0,003	0,071	0,3
Cadmium, mg\dm3	0,000	0,000	0,000	0,000	0,001
Lead, mg\DM3	0,135	0,048	0,061	0,018	0,03
Zinc, mg\DM3	0,495	0,345	1,73	0,144	1,0

To determine the integral parameters of water quality for aquatic organisms, the Biotest method is used. To characterize the quality of standing and running waters and the degree of their purification, small crustaceans are used as ideal test targets. The Daphnia test, unlike other biotests, is distinguished by its hypersensitivity to natural toxic substances, good results in experiments.

To conduct the experiment, the following laboratory instruments are used: a microcompressor according to AEN Tu 16–064011, an analytical scale, a 250 ml-K meter and cone-shaped flasks, a 500 ml-K Glass, a measuring cylinder, an aquarium, a magnifying glass, a glass tube with a diameter of 5–7 mm, a pipette, a glass rod.

Harmful substances used in research work: Ca(OH)2, PbCl2, ZnCl2, soap solution, electroplating water of transformer and excjvator plants.

To carry out the Biotest, all containers must be washed clean and rinsed with distilled water.

During the research work, 0.5 % of the substances necessary for the experiment were prepared. It should be done in the following sequence: 1–g of the poison is taken on an analytical scale, mixed with 200 ml of distilled water, and then poured into the aquarium the day before with drained water and placed daphnia and bosmina. After 10 copies of Daphnia are placed in each of the control and experimental containers with a glass tube with a diameter of 5–7 mm, biotesting is carried out for 24–168 hours.

While the experiment is going on, the temperature in the room should be between + 20 and + 22 ºC. Water temperature measurements are carried out once a day for Biotest. During the experiment, after 24–168 hours, the survivors or dead of the Daphnia are recorded, and the number of living Daphnia is calculated. That is, they are registered when they move freely on the surface of the water or when they float from the bottom of the container for more than 15 seconds. During the experiment, with the help of a magnifying glass or with the naked eye, you can see the surviving Daphnia every hour.

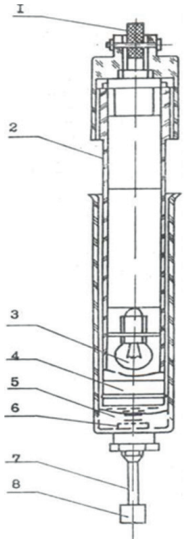

Figure 1-diagram of the indication tube

1-circuit breaker; 2-stem body; 3-Light Source; 4-piston; 5-indication tube body; 6-mesh; 7-capillary; 8-valve.

As a device for measuring Daphnia's heartbeat, that is, as the main element of the optical system of the installation, a microscope is used. Microscopes are suitable for conducting research in the CIS, as well as far abroad. In this installation “Amplival” K. Zeiss, the yen microscope is often used. During the experiment, a microphotochon is used to visually monitor the results of the work. The brand of mycorphotolon does not have a very fundamental value.

The priincipital system of the unit is shown in Figure 5. The beam of the heated lamp (Figure 1) is transmitted to the Collector lens (2) and the plane diaphragm (3), and it is directed to the mirror, (4) to the capacitor (6). Excess light flux (5) can weaken the neutral light filter. The capacitor focuses the radiation on the object of study (8), which is located in a special flow chamber located on the microscope object table.

Microobjective (9) focuses on the object under study. Light passing through the object, collected in a microobject and enlarged in a microphotochrome prism (10) or on a semi-transparent mirror surface, creates an image of the object.

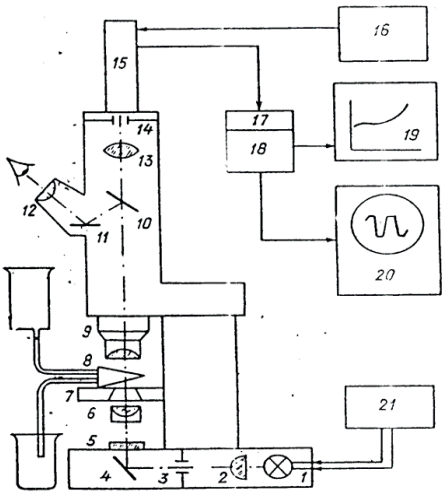

Figure 2-principled scheme of the device for measuring the rhythm of the beating of Daphnia's heart
1-incandescent lamp; 2-Collector lens; 3-diaphragm; 4,10,11-Mirror; 5-light filter; 6-capacitor; 7-object microscope Table; 8-cuvette camera; 9-microobjective; 12-eyepiece; 13-object; 14-output hole; 15-FEC; 16-super-high voltage source; 17-amplifier; 18-periodometer; 19-self-recorder; 20-oscilloscope; 21-incandescent lamp block.

The image of an object in a semi-transparent mirror can also be observed visually through a system consisting of a parallel mirror and (12) eyepieces. A ray of light passing through a semi-transparent mirror (13) is focused on the object (14) at the exit. Then it is projected on the FEC-15 photocathode. The signal from the FEC (17) enters the amplifier from it to the periodometer (18).

To monitor such a temporary parameter as the shortening of Daphnia's heart, a periodometer is specially compiled. His work is explained by the transformation of the sequence" T – U "in time by the method of constant" U " integration and memorizing a cell equal to the duration of the next period. Thus, the signal from the periodometer is in

the form of a constant unipolar voltage jump, the height of the nth row is proportional to the value of the nth period, and the duration is equal to the duration of the N + 1 period.

Thus, the signal from the periodometer is in the form of a constant unipolar voltage jump, the height of the nth row is proportional to the value of the nth period, and the duration is equal to the duration of the N+1 period.

The instrument has the following characteristics: measuring rhythm limit τ=10-1000 Ms, change steepness 5 MV\s, nonlinear change steepness less than 1%, supply voltage -0.0 + 9 V, power consumption for amplifier and periodometer 0.4 W. The signal received by the periodometer was carried out by the oscilloscope C1 - 19 V. The output signal is recorded through the self-recorder 19 (Figure 5).

Conclusion

According to the regulatory requirements for natural water sources, water quality must ensure the balance of the ecosystem in it. The purity of water was achieved by the result of the existence of hydrobionts in it. In this regard, it was proposed that the ecological system of natural water sources should be considered not individually, but the effects of urban and industrial waste water added to it. Currently, the method of biological indication is considered a very accurate method and allows you to assess the stage of water pollution, etc. By studying the vital activity of hydrobionts closer to the natural norm, it is possible to increase the accuracy of the biological method in assessing water quality. In determining water quality, the use of Daphnia in Biotest is an effective method. It turned out that the Daphnia test was distinguished by its high sensitivity to various natural poisons, its superiority over other biotests, and its good repeatability of the results of the experiment.

To determine the integral parameters of water quality for aquatic organisms, the Biotest method was used. To characterize the quality of standing and running waters and the degree of their purification, it was ensured that small crustaceans can be suitable test objects.

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