aureus, *B. subtilis*, *E. coli*, *P. aeruginosa*) and yeast fungi (*C. albicans*), but compounds **1a** and **3a** have a pronounced selective bactericidal action.

The culture of gram-positive cocci showed the highest sensitivity to compounds **2a** and **2b** (MIC = 31.2 μg /ml), and other substances were characterized by weak bacteriostatic action.

The sensitivity of *E. coli* culture to the synthesized compounds ranged from 31.2 to 125 μg/ml. The exception was compound **3b**, which effectively inhibited the growth of this culture at a dilution of 7.8μg/ml. With somewhat less force, the synthesized substances acted on gram-negative *P. aeruginosa*. Compounds **1b**, **2c** and **3a** were effective against *Pseudomonas* (MIC = 62.5 μg/ml). Thiocyanatoamide **1a** has the most pronounced antimicrobial properties, the activity of which against *C. albicans*, *P. aeruginosa* and *B. subtilis* strains was found at the level of 3.9-7.8 μg/ml.

Comparison of the compounds **1-3** antimicrobial activity with previously synthesized anionarylation products indicates a positive effect of sulfanilamide fragment in their structure on the expansion of activity spectrum and reducing of the minimum inhibitory concentrations values.

The obtained results allow asserting the effectiveness of compounds **1-3** in antimicrobial activity terms, which reveals the prospects of their usage as synthons for the construction of new sulfonamide drugs with selective action.

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THE STATE OF SURFACE WATERS UNDER CONDITIONS OF ANTHROPOGENIC LOADING (Kyiv)

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Anthropogenic pressure on urban water bodies affects the natural balance of surface waters, causes changes in their trophic status and causes pollution of their basins. Changes in the morphological and functional characteristics of biocenosis

components are often observed in water bodies located in urban areas. Microorganisms and their biological activity are known to be more sensitive to contamination, since they change in the first place under anthropogenic influence.

The material for the research was bacterioplankton and bacteriobenthos samples taken in the Jordan (Opechen's system) and Verbne Lakes, located on the urbanized territory of Kyiv (Obolonskyi district). Jordan Lake is located on the right bank of the Dnieper River in the area of the former Pochaina River floodplain. Verbne Lake was formed in the Dnieper River floodplain, although today it is separated from the main part of the floodplain by residential buildings and transport routes. Water features are characterized by different flow modes, lack of sanitary protection zone, localization in industrial and residential areas, recreational load. The materials of microbiological monitoring of lakes during the growing season 2018 are presented. Waters and bottom sediments were collected at three stations in each of the lakes − coastal littoral with different macrophytes intensity and central part. Higher and submerged aquatic vegetation, intensive development of cyanoprokaryotes, waterfowl and considerable recreational load were noted near the sampling areas on the lakes. The bottom sediments at the sampling stations were represented by medium-sized dispersed sands and detritus silt containing residues of hydrobionts and aquatic plants. The depth of selection was 0.5-0.7 and 8.0-10.0 m.

To study the bacterioplankton and bacteriobenthos abundance, preparations were prepared on black polycarbonate membrane filters (Millipore, d_{size}=0.22 μm), followed by staining with fluorochrome 4,6-diamidino-2-phenylindole (DAPI). The studies were performed using an Axio Imager A1 (Zeise) microscope at the Institute's Center for Collective Use. To determine microorganisms with different trophic needs, water samples and bottom sediments were plated on different agars. Among the eutrophic bacteria, the number of microorganisms with an active electron-transport system was taken into account [5].

The number of bacterioplankton in water bodies during the growing season depended on the sampling location and ranged from 2.1 to $7.6 \cdot 10^6$ cells ml^{-1}. For seasonal dynamics, there was a decrease in numbers during the growing season for both lakes. Such changes

was related to the weather conditions during the year, the intensity of recreational loading, anthropogenic pressure.

The number of bacteriobenthos in the studied water bodies was in the wide range from 1.5 to 49.2·10^9 cells g^{-1}. Maximum values were fixed for detritus silt from the depths of lakes. For the seasonal dynamics of bacteriobenthos studied water bodies observed an increase during the growing season. The fixed order of magnitudes and amplitude of fluctuations in bacterioplankton and bacteriobenthos abundance was characteristic of many of aquatic ecosystems different types.

The proportion of cells with an active electron-transport system, indicating the intensity of bacteria, in the water and bottom sediments of the studied water bodies during the season fluctuated widely, respectively 3.1-99.9% and 45.1-99.7% of the number of eutrophic bacteria. Maximum values were fixed for summer-autumn seasons. During the growing season, the morphological composition of the bacteria of the water and the bottom sediments of the studied lakes was characterized by the dominance of the cocci, the presence of a large number of filamentous forms from the rod-shaped bacteria and individual curve-shaped cells. Detected morphological forms of bacteria are characteristic of bacteriocenosis of water bodies and the like, which have been noted in hydroecosystems of different types.

The bacterioplankton and bacteriobenthos of the studied water bodies contained microorganisms with different trophic needs, namely eutrophic and oligotrophic bacteria. The number of eutrophic and oligotrophic bacteria in the water of the studied water bodies during the growing season depended on the sampling areas and amounted to 5.3-167.6 and to 1.6-107.2·10^3 cells ml^{-1}, respectively. The maximum values in both lakes were recorded in the waters near the recreation areas of the population. In bacterioplankton and bacteriobenthos of lakes observed more intense development of eutrophic bacteria than oligotrophic ones. The relationship between these groups of microorganisms is usually determined by the quality and availability of organic matter. Data from the study of the number of eutrophic and oligotrophic bacteria, as well as cells with active electron-transport systems of water and bottom sediments, showed that the order of magnitudes and amplitude of oscillations of the indices are characteristic of many aquatic ecosystems.

According to ecological standards of surface water quality [2], both in terms of bacterioplankton abundance and number of eutrophic bacteria, deterioration of the state during the growing season was observed (from III class, 4 categories, “poorly polluted”, β"-mesosaprobic, eutrophic to V class, 7 categories, “very dirty”, polysaprobic, hypertrophic). It should be noted that the values of bacterioplankton numbers were better than those of the ecological-trophic group. Similar results were obtained in other investigations [1, 3, 4].

In accordance with current approaches to water management, the studied water bodies should be considered as substantially modified. Data analysis shows that water bodies are unable to achieve "good" environmental potential. Therefore, the development of microorganisms during the 2018 growing season showed the following. Spring waterfowl − intensified terrigenous runoff from adjacent sloping territories, which brought not only allochthon microflora, but also pollution. In the summer, this situation was joined by intensive recreational loading of the population, development of cyanoprokaryotes and other algae, intensive vegetation of higher aquatic vegetation, increase in the number of waterfowl and feeders for them, increase of water temperature, decrease of water level in water bodies and oxygen saturation. In autumn, the gradual decrease in the concentration of the above factors, but added seasonal dying of vegetation, leaf fall, decrease in water temperature and terrigenous runoff from the territories carrying various pollution. It is obvious that urbanization causes changes in water bodies, causing disturbance of the natural balance and, as a consequence, the status and constituents of the ecosystems of lakes.

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МАТЕМАТИЧНЕ МОДЕЛЮВАННЯ НА ОСНОВІ КОРЕЛЯЦІЙНОГО АНАЛІЗУ ДОСЛІДЖЕНЬ ЕЛЕМЕНТІВ ЖИВЛЕННЯ В ҐРУНТАХ

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Не можна уявити собі сучасну науку без широкого застосування математичного моделювання. Суть цієї методології полягає у заміні вихідного об’єкта його «образом» – математичною моделлю, а в подальшому – у вивченні моделі з допомогою обчислювальних алгоритмів реалізованих у вигляді