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**Wpływ izolacji wody w buteleczkach na ilość bakterioplanktonu
— The Influence of the Isolation of Water in Small Bottles
upon the Quantity of Bacterioplankton**

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For a long time the method of isolation of water in small bottles has been applied in the investigations of metabolism in water reservoirs. It has been used by those who have examined the primary production of water reservoirs (see Vinberg's monograph, 1960) and recently there has even been elaborated the method of investigation of intensity of multiplication on of bacteria (Razumov 1948) and of production of bacterioplankton biomass (Ivanov 1955), applying the method of isolation of water in small bottles.

In these investigations, it is assumed that the isolation of water for a period of time in a small bottle does not produce any significant changes in the life of living organisms present in this isolated water. However, since the publication of the works of Baier (1933) and of Zo-Bell and Anderson (1936) in which they characterised the intensity of multiplication of bacteria in isolated water, a number of authors (among others Lastockin 1945, Kriss 1959, Pratt and Berkson 1959) gave as their opinion that the use of isolation of water in small bottles during the investigations of primary production and intensity of bacteria increase does not bring the reliable results.

In this connection the present author wanted to compare, while investigating the intensity of the multiplication of bacteria (Czczuga 1961), the obtained results of computations of the general quantity of bacteria in the water of the Rajgrodzkie lakes with the quantity of bacteria in the same water kept in small bottles in the lakes.

The Method

Water was collected, with the help of a Ruttner system water sampler, from the surface layer of the lake (1 m depth) and was then

siphoned into two previously sterilized 250 ml bottles with specially filed corks. To one of the bottles 7.5 ml of 40% formalin was added, while the other was put at once into the lake at the same depth at which the water had been taken. The time of keeping the bottles in the water oscillated from 10 to 19.5 hours in the summer and from 14 to 16 hours in the autumn. After being removed from the lake 7.5 ml of 40% formalin was also added. In the laboratory the bottles were well shaken and about 10 ml of water was taken from them three times and then drained through a membrane filter No 3. These filters, together with the bacteria present on them, were stained with 5% erythrosin solution in 5% solution of phenol (R a z u m o v, 1932). The quantity of bacteria was counted under immersion with 900 magnification. The samples of water were taken in the summer when the temperature of the water reached 24 °C and in the late autumn at a water temperature of 5 °C. The samples were taken from all the Rajgrodzkie lakes, starting with Lake Białe, similar to the oligotrophic lakes, from Lake Rajgrodzkie and Lake Drętwo (mesotrophic), from Lake Krzywe (eutrophic), and from Lake Ślepe (dystrophic).

Results of Investigations and Discussion

The obtained results of researches are shown in a table, from which it may be seen that in water isolated in small bottles the quantity of bacteria remains the same as in the water of the lake. The balance between the increase of bacteria and their being consumed by zooplankton and the mortality does not change because of the isolation of this water in small bottles.

At present it has been extensively confirmed that the volume does not positively influence the increase in quantity of bacteria. This can be seen in the precisely carried out work of Taylor and Collins (1949) and is also indirectly shown from the data by Gessner (1953) and Šcerbakov (1953). It may be supposed that during the exposure of the small bottles with water in the lake, the quantity of bacteria on the surface of the glass inside the bottles increases considerably (Z o - B e l l, S t a d l e r 1940). According to the data given by Vinberg and Jarovicy na (1946), after a lapse of 24 hours, in the bottles immersed in the lake only 8,8% of the total quantity of bacteria is present on the walls of the bottles.

It is known that some authors have considered that the sun's rays inhibit the multiplication of bacteria in the surface layer of water reservoirs. It may be supposed that also in the present case this factor inhibited the intensity of the multiplication of bacteria.

The Quantity of Bacteria in the Water of Rajgradzkie Lakes

A — before exposure in small bottles

B — after exposure in small bottles in the lake

Lake	Date	Temperature of water in °C	Time of exposure in hours	Quantity of bacteria in 1 ml of water in thousands	
				A	B
Białe	28. VIII. 59	23,0	15,0	1000,8	926,3
				836,0	863,5
				887,0	922,4
	20. XI. 59	4,5	14,0	1420,8	1576,9
				1504,8	1593,5
				1605,4	1652,5
Rajgradzkie	27. VIII. 59	22,0	19,5	1220,6	1220,7
				1338,4	1433,8
				1436,5	981,3
	20. XI. 59	5,0	14,0	1460,1	1668,1
				1390,6	1711,3
				1413,1	1770,2
Dreństwo	26. VIII. 59	24,0	10,0	577,7	1087,0
				573,0	864,0
				687,0	824,0
	27. VIII. 59	22,0	12,0	1177,0	1154,0
				1010,0	1084,0
				1123,0	1197,0
	19. XI. 59	5,0	16,0	1805,4	1606,0
				1593,1	1641,7
				1625,0	1670,0
Krzywe	28. VIII. 59	23,0	15,5	2190,2	2249,0
				2209,8	1891,5
				2159,0	2088,0
	20. XI. 59	5,0	14,0	2213,8	2217,7
				2268,0	2406,0
				2178,4	2170,5
Ślepc	20. XI. 59	5,0	14,0	2559,1	2472,8
				2513,9	2456,4
				2614,0	2535,6
mean				1546,4	1597,2
%				100,0	103,2

The specially carried out work by Vaccaro and Ryther (1955) contradicts these assumptions. There are a number of other works (Purdi 1937, Hutchinson 1941, Lund 1949, Jackson, McFadden 1954, Stojanowski 1958) which indicate that processes occurring in small bottles do not differ greatly from similar ones in water reservoirs. The influence of yet other agents, mentioned by Vinberg (1960) in his monograph, whose action manifests itself in sporadic cases, has not been taken into consideration in the present work.

From the observations made and the literature it follows that the isolation of water in small bottles during the investigations of primary production and the intensity of bacteria multiplication does not cause an excessive increase in bacteria in water isolated in small bottles.

STRESZCZENIE

Autor porównał wyniki obliczeń ogólnej ilości bakterii (na sączkach membranowych No 3) w wodzie wprost z jezior Rajgrodzkich oraz w tej samej wodzie izolowanej w buteleczkach, które wstawione były przedtem do jezior. Ilość bakterii obliczano wg metody Razumova (1932). W wyniku badań stwierdzono, że ilość bakterii pozostaje prawie że taka sama w wodzie w buteleczkach jak w wodzie na początku doświadczenia (nie izolowanej) (tabela). Z tego wynika, że posługiwanie się w badaniach hydrobiologicznych metodą izolacji wody w buteleczkach nie powinno budzić zastrzeżeń co do otrzymywanych wyników.

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