



## MYXOBACTERIA AS BIOINDICATORS OF WATER ORGANIC LOAD OF THE BACHKA REGION D-T-D CANAL NETWORK

PETROVICY Olga, MATAVULY Milan, BORKOVICY Zorica,  
RADNOVICY Dragan, GAYIN Slavka, SIMEUNOVICY Yelica,

DEPARTMENT OF BIOLOGY AND ECOLOGY, FACULTY OF SCIENCES,  
UNIVERSITY OF NOVI SAD, D. Obradovicya square 2,  
YU-21000 NOVI SAD, SERBIA AND MONTENEGRO

### ABSTRACT:

*In the frame of the project No 1945, "Hydrobiological Investigations of the Danube-Tisza-Danube (DTD) Canal Network with the aim of a Wise use and the Sustainable Development of the Resources" supported by ministry of Science and Technologies of the Republic of Serbia, investigations of myxobacteria as a new microbiological indicator of water organic load have been undertaken. Due to their multienzymatic nature, myxobacteria are considered as a good bioindicators of organic pollution of water.*

*Results obtained in this investigation show that organic load of canal waters, estimated according to the number of this sampling site. Using categorization system after Lecianova (4), quality of water ranged between almost pure water, over slightly and moderately polluted, to the range of extremely polluted water. As a bioindicators parameter, myxobacteria quantitative composition correlated significantly with other classical microbiological indicators of the water organic load.*

**KEY WORDS:** *myxobacteria, organic load, canal water quality, Bachka*

### 1. INTRODUCTION

The main net of the irrigation and transportation DTD canal net, together with canal net of the Banat region, of the length of about 1000 km, consists of interconnected artificial canals and watercourses which, being regulated, have lost some of their original natural properties, and are subjected to the permanent anthropogenic influence. This canal net has been of the great significance for the region, first of all for an agricultural artificial irrigation, for transportation too, and also for fish culture and water supply under the condition of satisfactory quality of water.

Since at the canal bank numerous settlements and industrial centers are situated, and also the agricultural production is being more and more intensive, the DTD canal water quality depends primarily on the degree of wastewater purification, not only in our country, but also in the states upstream of the river Danube, the river Tisza and other smaller watercourses coming from the neighboring Hungary and Croatia.

Since during the last decade a condition of canal waters of the Vrbas-Srbobran section was very bad with a very low quality of water (1, 2, 5, 6, 10) the aim of our investigations was to determine a recent quality of water of the same object in order to compare the condition before and after measures undertaken for the protection and conservation of natural surface watercourses of DTD system and to compare with other canal waters.

The efficient water quality control consider today introduction new methods and parameters indicating the level and the nature of water contamination. One of the most exploited parameters today is the enumeration of organotrophic bacteria, indicating the presence of easy-to-degrade organics and enabling the categorization of water into the classes of bonity (9). Also, myxobacteria, due to their multienzyme complexes, are considered as relevant and good indicators of the water organic load (3, 4, 7, 8, 11).

## **2. MATERIAL AND METHODS**

In the course of 2002, the samples of canal waters of the Bachka Region have been analyzed. Besides other microbiological analyses, quantitative composition of specific group of aerobic saprophytic bacteria has been determined champignon-agar (4, 9).

The estimation of water organic load has been done according to the scale adjusted for the surface freshwaters, after the same autor (4).

## **3. RESULTS AND DISCUSSION**

After publishing our results regarding investigation of Bezdán – Vrbas section of the DTD canal system (1,2,5,6) these investigations were continued at several sections of the Bachka canal network. Besides other microbiological analyses, the quantitative composition of mixobacteria, specific aerobic saprophytic group of bacteria, has been recorded. Also, heterogeneous quality of the same canal water sample reflects the dynamic of complexity of seasonal ecological factors.

Generally could be stated that, in the course of summer and autumn (from 2002 June, August, and November) myxobacteria were found to be present in all samples of canal waters. At some localities dominated typical bacteriolytic forms, mainly with visible fruting bodies. In some other samples typical cellulolytic forms were abundant. Domination of different groups of myxobacteria in different samples was caused probably by specific complex conditions of specific locality.

The count of myxobacteria in investigated water samples fluctuated considerably too, depending on season as well as according to sample. In the most of cases, in almost all of samples, the higher numerical values in the summer season (July) have been recorded.

Analyzing the mean values of the myxobacteria abundance in canal waters (Fig. 1) the differences in number of this group of bacteria could be noticed, indicating various quality of water. According to the Lecianova categorization (4), the water quality ranged from clean, over slightly and moderately polluted, to the exceptionally polluted waters. Out of 20

samples, only three turned to have clean waters (sampling sites: Bachki Petrovac, Novi Sad – Kacyki most, and Vrbas, upstream of the industrial wastewater discharge). On the basis of the categorization after Lecianova (4), according to the myxobacteria abundance, the most of waters (10 out of 20 samples analyzed) of the Bachka Region canal waters belonged to the slightly polluted by organic matter (Criterion 10-30 CFU/cm<sup>3</sup>). Six others belonged to the moderately polluted (Criterion 30-60 CFU/cm<sup>3</sup>)

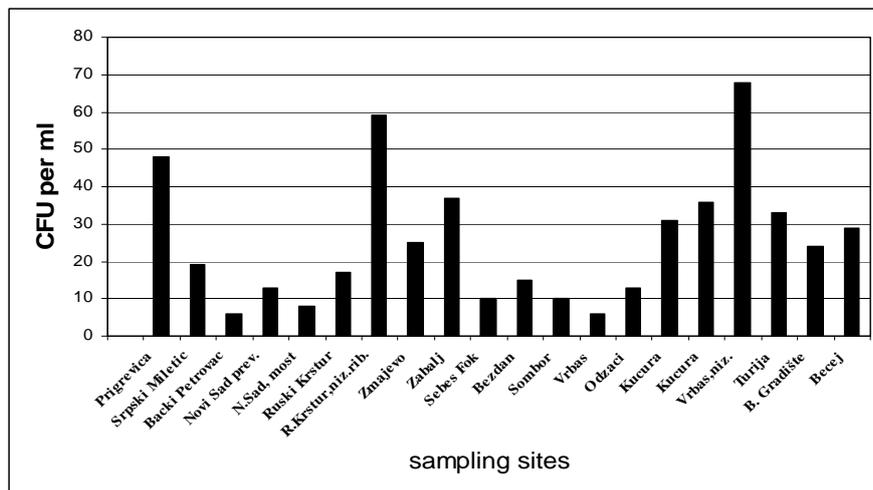


Fig. 1. The myxobacteria abundance in canal waters (mean values)

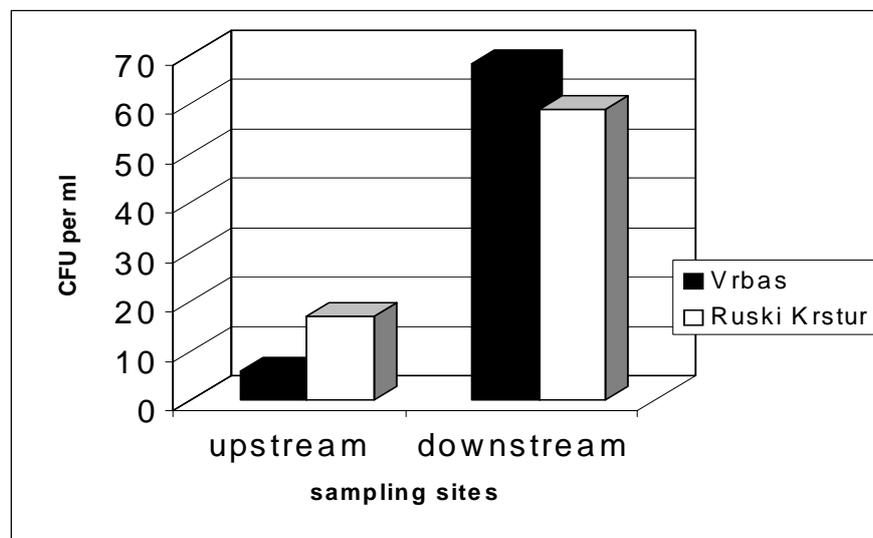


Fig. 2. Quantitative composition of myxobacteria, indicating water organic load upstream and downstream of wastewater discharge.

Unlike to these sampling sites, one sampling site was characterized with exceptionally polluted water. The high number of this group of bacteria, downstream of the Vrbas town wastewater discharge into canal as a recipient (Fig. 1), indicate the high organic load of this water, in comparison with the low organic load of the same water upstream of wastewater discharge (Fig. 2). Our earlier published results of investigation of impact of edible oil factory wastewater discharge revealed (10) disastrous influence of industrial wastewater on the canal recipient waters, with number of myxobacteria reaching enormous quantities of several thousands per cm<sup>3</sup>.

The similar situation was noticed in the course of 2002 at the Kosanchicy-Mali Stapar canal stretch, at the Ruski Krstur sampling site (Fig. 1, and Fig. 2). Obviously, the canal water quality was determined by the presence of cage fish aquaculture. Canal water upstream of the fish cages was found to belong to category of slightly to moderately polluted, but, downstream of the cages, turned to belong to moderately polluted category after Lecianova (4).

### 3. CONCLUSION

Results of microbiological examinations of the quality of DTD canal water shows remarkable fluctuations of number of investigated group of bacteria, what reflect the fluctuations in water organic load. Heterogeneous quality of the same canal water sample reflects the dynamic of wastewater discharge, as well as complexity of seasonal ecological factors.

According to the myxobacteria count most of water samples could be classified as slightly or moderately loaded by organics, only waters downstream of the Vrbas town industrial wastewater discharge into canal as the recipient was found to be exceptionally polluted by organic matter, testifying about high and permanent influx of organic contaminants.

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