Hygienic bacteriological valuation of the Upper Tisa Region

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Introduction

The load of organic and inorganic pollutants on waters increases year by year. The increase of the level of organic pollution is indicated by the worsening of hygienic bacteriological characteristics of rivers and lakes. Csépai (1995) reported on the same tendency in River Maros. The present paper analyses the pollution effect of River Szamos and presents the bacteriological characteristics of the Ukrainian upper section of River Tisa. These parameters are compared with the bacteriological values obtained for the North Hungarian section of the river.

Keywords: hygienic bacteriology, Upper Tisa

Material and Methods

We took samples at 9 sites on the Ukrainian section of the Upper Tisa between 16-18 August 1995. The samples were kept in cool and sterile glass vessels until the investigations commenced on 18 August 1995. Coliform and Faecal coliform bacteria were detected according to Hungarian Standards No. MSZ ISO 9308-2:1994. Numbers of Faecal streptococcus were determined according to Hungarian Standards No. MSZ 448/44:1990, and the total number of colonies was obtained according to Hungarian Standards No. MSZ ISO 622:1992.

Results and Evaluation

Nine water samples (numbered in accordance with the direction of flow) were taken in the Ukrainian catchment area of the Upper Tisa section, at the following locations:

Sampling sites: 1. Chorna Tisa, 2. Bila Tisa, 3. Tisa below Rachiv, 4. Tisa at Dilove, 5. Tisa above Tereblia, 6. Tereblia at confluence, 7. Tisa at Viskove, 8. Tisa at Vinogradiv, 9. Tisa at Vilok

The bacteriological measures of collected water samples appear in the following table:

Components	Dimension	Samples								
		1	2	3	4	5	6	7	8	9
Total colony 22 °C	1/ml	40000	14000	44000	160000	60000	48000	51600	13400	38000
Total colony 37 °C	1/ml	5520	2700	24200	81600	25600	22560	26800	7040	22400
Coliform	1/ml	1,7	2,4	6,2	8,1	7,2	28,0	<160	21,0	21,0
Faecal coliform	1/ml	0,8	1,9	5,2	6,4	4,7	22,0	160,0	11,0	2,0
F. streptococcus	1/ml	6,6	6,0	5,2	10,6	1,2	0,6	(*)	0	0,1

(*) - Sampling error !!

	Chorna Tisa 1.	Bila Tisa 2.	Tisa below Rahiv 3.	Tisa at Dilove 4.	Tisa above Tereblia 5.	River Tereblia 6.	Tisa at Viskove 7.	Tisa at Vinogradiv 8.	Tisa at Vilok 9.
Coliform	II.	II.	II.	II.	II.	III.	IV.	III.	III.
F.coliform	II.	III.	III.	III.	III.	IV.	V.	IV.	III.
F.strepto-coccus	III.	III.	III.	III.	II.	II.	I.	I.	I.

Classification: I.- excellent, II- good, III.-moderately, IV.-polluted, V.-strongly polluted

Table 1. Results of the bacteriological investigation of water samples

The total number of colonies were of the same order at each of the sampling sites. Values of Coliform bacteria numbers were between 1.7/ml - 8.1/ml at sampling points 1-5, which indicated water quality of class II. From sampling site 6, the number of Coliforms increased by one order, indicating organic contamination. Sampling site 7 did not fit in this tendency with its extreme Coliform value (160/ml), since the total number of colonies did not indicate such marked increase of organic contamination. Consequently, this value was considered a sampling error.

At sites 1-5 the number of Faecal coliforms varied between 0.8/ml and 6.4/ml, which indicated water quality of class III. Their numbers were higher at sampling sites 6-9, where the quality of water was of class IV.

Values of Faecal streptococcus numbers ranged between 0.1/ml and 10.6/ml. For the qualification of sampling sites see Table 1. Valuation proceeded as specified in Hungarian Standards No. MSZ 12749:1994.

Sampling sites	Time	Chloro-phyll-a ug/l	Total algal number ind/l	Total colony 37°C	Coliform ind/ml	F. coliform ind/ml	F. strepto-coccus ind/ml
Tisa at Tiszabecs	VI. 19 8^{00}	2,96	433.700	15.000	33	5,6	0,2
Tisa at Tivadar	VI. 19. 23^{00}	2,96	440.000	13.100	49	7,9	0,2
Tisa at Jánd	VI. 20. 8^{00}	3,6	180.000	21.000	130	22	0
Tisa at Vásárosnamény (left)	VI. 20. 9^{00}	4,7	540.000	400.000	170	49	0,1
Tisa at Vásárosnamény (current)	VI. 20. 9^{00}	9,5	572.000	166.000	310	70	0,3
Tisa at Vásárosnamény (right)	VI. 20. 9^{00}	8,3	630.000	25.000	79	22	0,3
Tisa at Aranyosapáti	VI. 20. 13^{00}	15,7	3.286.000	27.300	220	46	0,6
Tisa above Záhony	VI. 21. 11^{00}	4,7	3.024.000	17.000	170	17,0	0,2
Tisa below Záhony	VI. 21. 11^{45}	14,2	2.448.000	15.000	130	11,0	0,4
Tisa above Tuzsér	VI. 21. 18^{00}	5,9	4.266.700	19.000	130	2,96	0,7
Tisa below Tuzsér	VI. 21. 18^{40}	13,0	4.400.000	20.000	140	2,96	0,8
Tisa at Dombrád	VI. 22. 9^{00}	11,8	3.377.800	6.000	170	12	0,2
Tisa Tiszatelek	VI. 22. 19^{00}	11,8	2.833.000	13.000	33	3,3	0,6
Tisa at Tiszabercel	VI. 23. 5^{00}	14,2	3.555.600	7.000	33	3,3	0,4
Tisa at Gávavencsellő above	VI. 23. 13^{00}	23,3	-	5.000	13	4,9	0,4
Tisa below Gávavencsellő (above Lónyai)	VI. 23. 13^{30}	30,8	7.428.600	9.000	17	7,0	0,4
Tisa at Balsa (left) (below Lónyai)	VI. 23. 15^{00}	19,0	7.600.000	4.000	7,8	3,3	0,1
Tisa Balsa (sodor) (beloweLónyai)	VI 23. 15^{15}	33,2	5.466.000	9.500	13	4,9	0
Tisa at Balsa (right) (belowe Lónyai)	VI. 23. 15^{30}	23,7	5.314.300	7.000	7,8	3,4	0

Table 2. Results of the bacteriological study (19–23 June 1995)

Between 19-23 June 1995 a hygienic bacteriological survey focusing on the pollution effect of River Szamos was carried out by the Upper Tisa Environmental Agency, on the North Hungarian reach of River Tisa. For the results of the hygienic and biological analysis, see Figure 1. and Table 2.

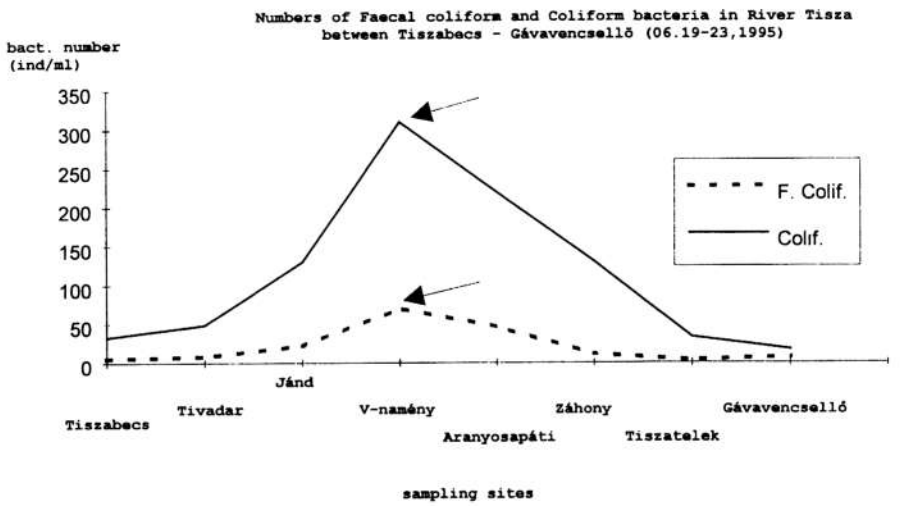

Figure 1.

The figure shows that pollution was limited between Tiszabecs and Vásárosnamény, as clearly reflected by bacteriological parameters. However, at Vásárosnamény (which is situated at the confluence of rivers Tisa and Szamos), the drastic contamination of River Tisa by the water of River Szamos is apparent. The high Coliform values (310/ml) were detected primarily in the main current of the river, while numbers near the right and left sides of the river were much lower. As a result of microbiological breakdown, Coliform numbers decreased moderately to 220/ml in the section extending to Aranyosapáti. Self-purification continued to Tuzsér, but slight contamination was detected again at Dombrád. Near Tiszatelek and Tuzsér self-purification reached its progressive stage resulting in the numbers of Coliforms dropping to 7.8/ml.

For being able to exactly determine the temporal and spatial processes of organic contamination in rivers Tisa and Szamos, it is necessary in the future to perform more frequent and more detailed hygienic bacteriological investigations of both rivers and their catchment area.

References

Csépai F.(1995): Data on the estimation of the hygienic bacteriological condition of the Maros/Mureş river. -Tiscia monograph series, 143-148.

Felföldy L.(1980): A biológiai vízminősítés 3. kiadás (Water quality assessment). - Vízügyi Hidrobiológia 9., 152-155.

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