INFLUENCE OF ANTHROPIC ACTIVITIES UPON TIMIS RIVER WATER QUALITY IN ARMENIS-CARANSEBES SECTION

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Abstract. *The theme addressed in this work is required by its importance and timeliness given the conditions of current climate change and growing anthropogenic pressure, maintaining the quality of natural resources becomes an increasingly pressing problem. Water, as a vital and limited natural resource in space and time deserves increasing attention. To maintain water quality at acceptable levels, measures are needed to monitor and reduce the impact of human activity on water resources. One cannot conceive a human activity, the existence of a life form or the current balance of the planet we live without water. The section where samples were taken to determine the water quality of the Timiş River is Armeniş-Caransebeş. Collection sheets have been drawn up for each sample in which all relevant research information has been detailed, the collection points have been clearly marked. The depth at which the samples were collected is 0.30 m, and the collected volume is 0.5 L. The width of the water gloss and the appearance of water have been identified in the harvest. Sampling of water took place in months: February, April, May, June, July, August and September of the year 2018. The water flow was determined and analyses were made on pH, dissolved oxygen, biochemical oxygen consumption in 5 days, chemical consumption of oxygen, ammonium, nitrate, nitrogen, total nitrogen, total phosphorus and calcium. Following the analyses carried out, it was observed that the flow rate is fluctuating depending on the amount of precipitation fallen, influencing the degree of water mineralization; water is slightly basic; The oxygen regime is in optimum values, with a slight decrease in the oxygen content in July and increased biochemical and chemical oxygen consumption in April, May, June; In the nutrient regime, high levels of nitrogen, nitrogen and total nitrogen are noted, which encapsulates water in quality class II; The amount of calcium and phosphorus is low, the concentration of phosphorus analysed has no impact on water, and calcium gives water a low hardness character. In conclusion, the impact of human activities on the quality of water in the Timiş River is reduced, with small overviews only to the nitrogen regime and the oxygen content in the water. The results of the research have a high civic value and can be disseminated by local authorities in the areas studied by informing the inhabitants of the impact of anthropogenic activities on the water quality of the Timiş River and the education of the population on pollution prevention.*

Keywords*: water quality, anthropic activities, clmate changes*

INTRODUCTION

Human water management is facing serious problems, caused by the sharp increase in water demand, the limited nature of water resources, as well as their uneven distribution, which implies large and costly works of fitting and accumulating water; deterioration of the quality of water sources as a result of human activity and the emergence of industries that unload residues containing very stable impurities, hard to remove from water by purge or treatment; increasing the requirements of standards on quality conditions that water needs to meet for population consumption (ZHU ET ALL, 2011, RADULOV ET ALL, 2016).

Finding solutions to these problems has imposed and imposes extensive and intensive development of water management work. It should also be taken into account that the industry has developed together with the growth of water consumption, water is used in growing quantities in agriculture as a result of climate change, and the growth of the degree of civilization and comfort entails increasing water requirements (CRISTA ET ALL. 2014, HAMEED ET ALL.2010).

Contemporary civilization has led, as we said, to the emergence of immense human concentrations, and the water supply of these urban agglomerations constitutes and will constitute a big problem, which has begun to be difficult since the seventh decade of the last century. On the other hand, demographic forecasts indicate a rapid increase in population.

It should not be overlooked that from the total amount of water around the Globe, not more than 2.53% is freshwater, of which 69.56% is found in glaciers, while 30.06% is underground and only 0.27% represents water that is easily usable for water use, but also for the existence and development of ecosystems

In the modern age, mankind has come to claim more and more water resources. We can find that water is closely linked to the terrestrial ecological system, and in order to maintain the balance of this system and itself for the survival of humanity, measures are needed to preserve and protect the hydrosphere globally (SMULEAC ET ALL, 2016).

In the last decades, under the influence of global climate change, the degradation of water quality has continuously increased, gaining forms that have gradually swept the entire planet, as a result of industrialization, with the proper stimulation of the procurement of raw materials, the development of transport and urban agglomerations, finally triggering the "ecological water crisis".

MATHERIAL AND METHODS

The Bega-Timiş-Cerna River basin is part of the Banat Hydrographic area, located in the south-western extremity of our country, occupying a surface of 18,320 sq km, that is about 7.7% of the total area of Romania and comprises the hydrographic network located between Mureş and Jiu, including the direct tributaries of the Danube between Baziaş and Cerna (figure 1).

Fig.1 Bega-Timis-Cerna River Basin

The territory of the Banat Water Administration respectively of the Banat Hydrographic Area includes the river basins:

-Bega-Timis-Caras-Code V

-Nera-Cerna-Code VI

-Danube tributaries between Nera and Cerna-Code XVI.

Timiş River Basins (5 673 sq km) and Bega (2 362 sq km), which together represent approx. 43% of the area of the Banat hydrographic area, have a special situation in terms of calculating the maximum leakage parameters, due to anthropogenic intervention that altered the natural distribution of leakage during periods of large waters and floods. Timiş and Bega basins are sometimes treated as a single Timiş-Bega basin, as they are linked by two derivatives (the Timiş-Bega derivative between Coștei and Balint and the Bega-Timiş derivation between the Topolovăţ and Hitias).

The Timiş River is considered to be the largest drainage river in the Banat hydrographic space, draining a base surface of approx. 5,673 sq km. He gathers his waters from most of the most important relief units in Banat, having at the border with Serbia the average altitude of the reception basin being of approx. 390 m. The main course of the Timiş River, seated along the intermountain depression aisle Caransebeş-Mehadia, is the main collector of several rivers that drain the Tarcu-Godeanu mountains, as well as the Semenic Mountains and Poiana Ruscă.

From the Tarcu Mountains – Godeanu receives mountain rivers, such as the Râul Rece (Hidiselul), with narrow valley and strong depth with slopes going below 25m/km only in the lower course and draining a base surface of approx. 180 sq km, with heights and medium slopes exceeding 1134 m.

From the Semenic Mountains, the Timiş receives small but similar tributaries, and from the intermountain depression aisle of Bistra, it receives the Bistra River, the water collector on the north-western slope of the Tarcu Mountains and the southern part of the Poiana Ruscă Mountains, summing up a reception surface of approx. 900 sq km, characterized by values of altitude and mean slope of the hydrographic basin of approx. 830 m and 330 m/km respectively.

In the lower course, the Timis with a wide, divagated valley with meanders, with a particularly low slope, has generated in the past floods on very large surfaces.

To reduce the effect of flooding on these lands, since the last century, the route was corrected and indigushed beyond the border. By making double interconnections Timiş-Bega, Timis natural hydrological regime, downstream of Coștei, is substantially altered as well as the one of Bega, by regularizing the debits according to necessity.

Timiş river, in the lower course, receives in a natural way important tributaries only from the left side, the most important being Pogănișul, which drains the mountains and the piedmont area from the northwest of the Semenic mountains with a bassin surface of approx. 671 sq km, characterized by altitudes and average slopes of approx. 230 m and 90m/km, respectively. Accumulations are mainly placed in the basin of Timiş, Bega, Caraș and Cerna.

In the warm period of 2017-2018, the development of cloud systems with special amplititude led to precipitation with large and significant quantitative intensities that had the effect of rapid floods; The affected areas were distributed diametrically opposite in the Banat hydrographic space.

Knowledge of the river drainage regime, and by default of the Timiş riverbank, is particularly important, with a view to sustainable management of water resources and ensuring an ecological balance in minor river beds and in the sides of the collector and of the tributaries, Moreover, the human intervention in the basin of Timisoara is a significant one since historical times.

Water samples were taken from the section of Armeniş-Caransebeş, Timiş River, in months: February, April, May, June, July, August and September of the year 2018. The analyses were carried out in the Water Quality Laboratory at the Resita river Basin Administration. There have been analyses of pH, dissolved oxygen, biochemical oxygen consumption in 5 days, chemical consumption of oxygen, ammonium, nitrites, nitrogenous, total nitrogen, total phosphorus and calcium. The results obtained were compared and interpreted with the physico-chemical quality standards of Order 161 of 2006, the Official Gazette of Romania which allows the framing of water in a quality class from I to V.

RESULTS AND DISCUSSIONS

The area where water quality was determined is the section of Armeniş-Caransebeş in length of 26 km, being on the starting course of the Timiş River.

The collected volume for the samples was 0, 5l, on a surface of 6250 cm^2. The riverbed in this section is a rocky and sandy one, so this is where several mineral microhabitats are encountered, between which we recall mesolithal or stones the size of a hand (6cm-20cm), covering an area of de70%, the microlithal or coarse gravel (2cm-6cm) is met, covering 20% of the area of the riverbed, the last being the akal, the fine and medium-size gravel (0.2 cm-2 cm), it covers 10% of the surface. The banks are low and with vegetation. The width of the gloss that we meet in this section is 2.80 m, and the depth at which the harvest is made is 0, 30m, the appearance of the water being a clear one. Water samples were taken in months: February, April, May, June, July, August and September of the year 2018.

Evolution of monthly flow in the Armeniş-Caransebeş section of the Timiş River

From measurements carried out on the Timis River, it has been noticed that the water flow (Figure 2) on the Armenis- Caransebes area is fluctuating, from 105 m^3/s in September to 249 m^3/s in June. This fluctuation is closely linked to the amount of rainfall fallen and has only influence on the degree of water mineralization in terms of its quality.

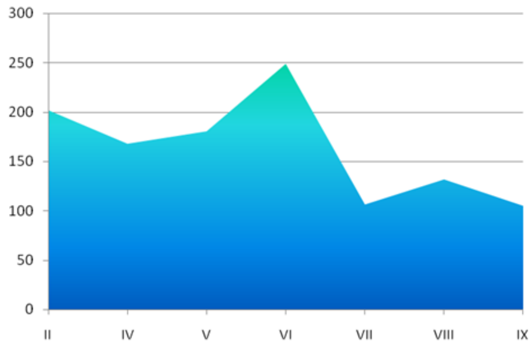

Fig. 2. Water flow on the Armenis- Caransebes section (mc/s)

The evolution of water quality in the Armeniş- Caransebeş area of the Timiş River

Following the laboratory analyses of water in the river Timiş the pH of the water falls between the normal values accepted by Order 161 from 2006, between 6.5 and 8.5 pH units. The water is slightly basal (Figure 3), with values from a minimum of 7.31 ph units in August to a maximum of 8.31 ph units in September.

With regard to the dissolved oxygen content (Figure 4), in February, April and May the water frames itself in I class quality, having a maximum of oxygen dissolved in water by 11.3 mg/l in February. In the rest of the months, water quality decreases from the point of view of the dissolved oxygen content to a minimum of 8 mg/L in July, also caused by the high temperatures of that month.

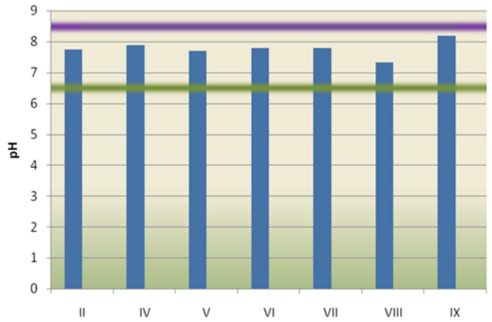

Fig. 3. The evolution of pH

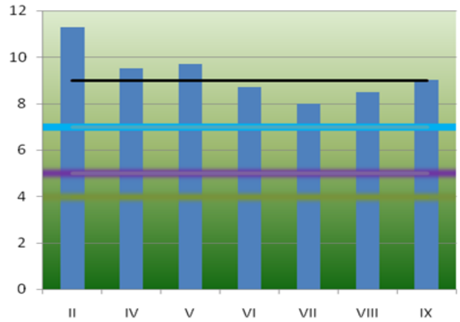

Fig. 4. Dissolved oxygen content (mg/l)

Biochemical oxygen consumption in five days, which is an indicator of the degree of pollution indicates low values for this indicator (Figure 5), from 1.5 mg/L in September to a maximum of 4.6 mg/L in April, the month in which the water is ranked in II quality class for this indicator. Chemical oxygen consumption (Figure 6) indicates a good quality water only from July to September, with values ranging from 9-10 mg/L. In the other months, water is in II quality class with values between 12.5 mg/L (February) to 18.72 mg/L in April.

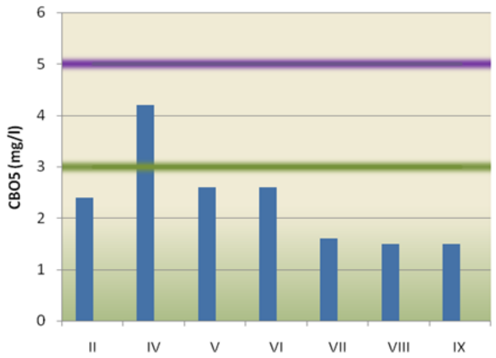

Fig. 5. Biochemical oxygen consumption

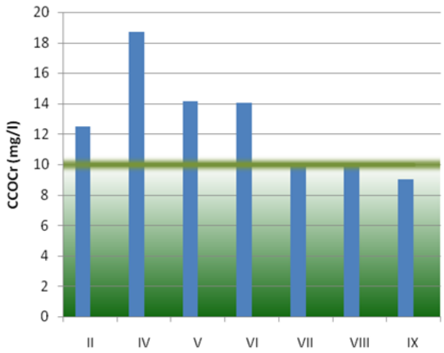

Fig. 6. Chemical oxygen consumption

As for the nutrient regime, the amount of ammonium in water (Figure 7) is small with values between 0, 023MG/L in September and 0.093 mg/L in June, far below the water quality class I of 0.4 mg/L.

The amount of nitrites in the water (Figure 8) is above I class quality, with values of 0.031 mg/L in August to 0.019 mg/L in the months of April and June, values that fit water in grade II quality. The highest value is recorded in February of 0.034 mg/L – Value which classifies water in in quality class III.

From the point of view of nitrogen content (Figure 9), water is classified in II class quality with values between 1.219 mg/L in August to 1.81 mg/L in February.

The total nitrogen content in water is reduced only in August and September (1.32 mg/l), in the rest of the year the values being above class I quality, from 1.6 mg/L in June to 2.5 mg/l in February (Figure 10).

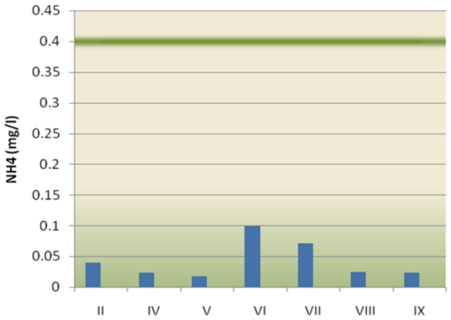

Fig. 7. Amount of ammonium

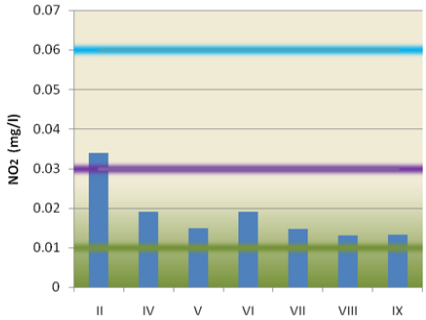

Fig. 8. Amount of nitrites

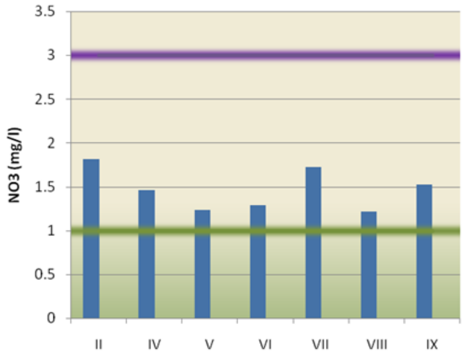

Fig. 9. Amount of nitrates

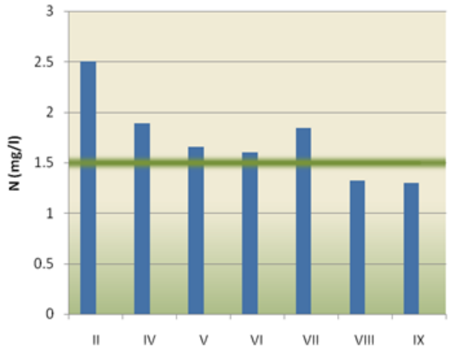

Fig. 10. Nitrogen content

The amount of phosphorus (Figure 11) is reduced, without impact on water, the values being far below the class I of quality, between 0.04 mg/L in February and a maximum of 0.13 mg/L in June.

The amount of calcium (Figure 12) is reduced, between 32 mg/L in August and 46 mg/L in April, values far below the quality I give water a low hardness character.

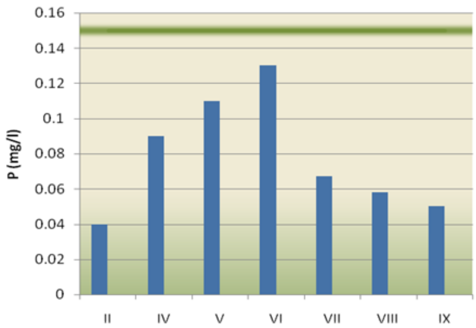

Fig. 11. Amount of phosphorus

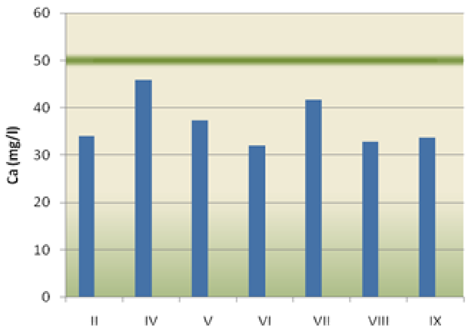

Fig. 12. Amount of calcium

CONCLUSIONS

The area where samples were taken to determine the water quality of the Timiş River is the Armeniş-Caransebeş area.

The riverbed of this area is a rocky and sandy one where we meet several mineral microhabitats. The depth at which the samples were harvested is 0, 30m, and the volume harvested is 0, 5l. The width of the water gloss and the appearance of water were identified when harvesting. Sampling of water took place in months: February, April, May, June, July, August and September of the year 2018.

There have been analyses of pH, dissolved oxygen, biochemical oxygen consumption in 5 days, chemical consumption of oxygen, ammonium, nitrites, nitrogenous, total nitrogen, total phosphorus and calcium. Following the analyses carried out on the water quality of the Timiş River, from the Armeniş-Caransebeş area, there were found:

• The flow rate is fluctuating depending on the amount of precipitation that has fallen, influencing the degree of water mineralization;

• Water is slightly basal due to pH values, which fall within the normal values accepted by Order 161 of 2006;

• Oxygen regime is in good value, with a decrease in oxygen content in July and increased biochemical and chemical oxygen consumption in April, May, June, which shows a load of nutrient water;

• In the nutrient regime, values of nitrates and nitrites and total nitrate have been noticed, which frames the water in II class quality.

• Both the amount of calcium and phosphorus is low, the phosphorus one is without impact on the water, and the calcium gives water a low hardness character, both having a lot below the quality limit.

• The impact of human activities in the water quality of the TImiş River is reduced, with small oversteps only to the nitrogen regime and the oxygen content in the water.

The results of the research have a high civic value and can be disseminated by local authorities in the areas studied by informing the inhabitants of the impact of anthropogenic activities on the water quality of in the Timiş River and educating the population on pollution prevention.

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