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THE CONTENT OF INORGANIC NITROGEN IN THE WATER FROM THE FIFTH CHANNEL NEAR THE CITY OF BITOLA

Tatjana Blazhevska[1], Marija Menkinoska[1], Valentina Pavlova[1], Zora Uzunoska[1]
Nina Dimovska[2]

[1]Faculty of Technology and Technical Sciences - Veles, University "St. Kliment Ohridski", Bitola, Republic of North Macedonia
[2]Food and Veterinary Agency, Bitola, Republic of North Macedonia
**Corresponding author: tatjana.blazevska@uklo.edu.mk*

Abstract

Water plays an important role in everyday life. Therefore, the subject of the analysis was the water along the upstream of the fifth channel MM1, MM2, MM3, which is located in the city of Bitola and the Crna River - MM4 where the channel inflows into the river. The survey was conducted in May and November. The following chemical parameters were made: the content of ammonia and nitrites in the water was determined spectrophotometric, pH value with a pH-meter, determination of nitrates with UV pastel, the consumption of potassium permanganate was determined by boiling in acidic environment and titration according to Kubel-Tiemann. From the obtained results, it can be concluded that the largest ammonia load (2.2 mg/L) is in the measuring point MM3, while the same values where the channel inflows in Crna Reka in MM4 are reduced. One of the recommendations is the implementation of treatment for the wastewater treatment before being discharged into the rivers.

Key words: *wastewater, communal water, pollution, environment*

INTRODUCTION

According to Kannel et al., (2007) with increasing of the human activity increases the quantity of wastewater. The fifth channel that is the subject of this research is located in the City of Bitola and is filled with water from the river Siva Voda which is relatively pure mountain water with low water level and it drains the wastewater from the industrial sector located in the city of Bitola and its surroundings. It drains the wastewater from the factory for yeast and alcohol, the sugar factory, the beer factory, the factory for production of paper packaging and cardboard, printing house " Kiro Dandaro " as well as faecal or wastewater from the village of Kravari and part of the City of Bitola. The water from the fifth channel not untreated is discharged into Crna Reka. The main purpose of this research is to determine the content of inorganic nitrogen, the quality of the water in the fifth channel, and provide guidelines for proper channel management.

MATERIAL AND METHODS

Material for analysis in this research is the water from the fifth channel and part of Crna Reka. The Measuring point 1 MM1 is located at the exit of the city of Bitola. In this part of the channel, wastewaters are mainly from: the sugar factory and the yeast and alcohol factory, from the beer factory, the factory for production of paper and cardboard packaging, the printing house "Kiro Dandaro", as well as part of the faecal waters from the city of Bitola. Measurement point 2 MM2 is the fifth channel in the village of Kravari. In this part of the channel flow waste and faecal waters from the village of Krivari. The measure point 3 MM3

is the fifth channel before it enters the Crna Reka. 4 MM4 is a measuring point where the fifth channel flows into Crna Reka. The survey was conducted in May and November. The following chemical parameters were made: the content of ammonia and nitrites in the water was determined spectrophotometric, pH value with a pH-meter, determination of nitrates with UV pastel, the consumption of potassium permanganate was determined by boiling in acidic environment and titration according to Kubel-Tiemann.

RESULTS AND DISCUSSION

One of the physico-chemical indicators of the state of water is the pH value.

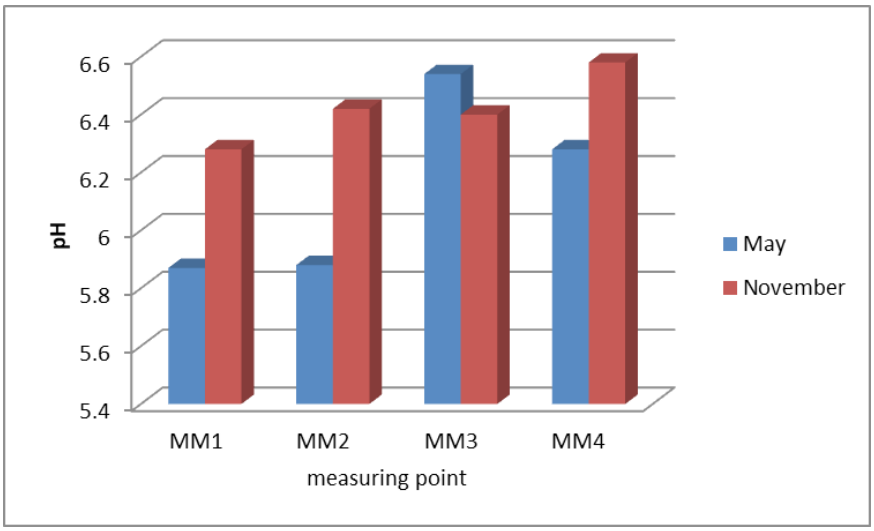

Figure 1. Water pH value in May and November.

From Figure 1 it can be concluded that the highest pH was measured in November in MM4 6.58 mg/L. In the same month, in all measuring points there are no large variations in pH due to the buffer capacity of the water. The lowest value is recorded in MM1 5.87 mg/L as a consequence of the influence of the waste waters from the industrial capacities.

Potassium permanganate consumption is an indicator of the content of organic matter present in the water.

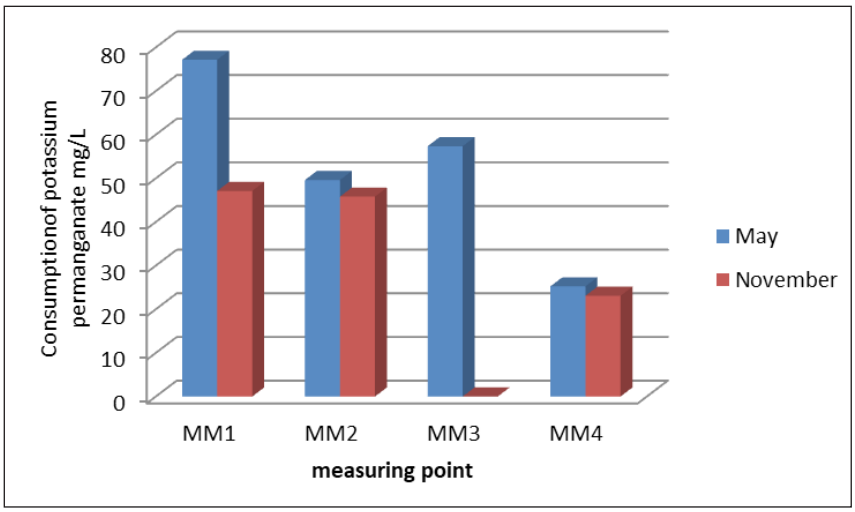

Figure 2. Consumption of $KMNO_4$ in the water from the fifth channel and Crna Reka for May and November.

The lowest value of $KMNO_4$ consumption was measured in MM4 on Crna Reka 23.07 mg/L in November (Fig. 2), due to the high water level of the river that affects the decomposition of organic matter. The highest value was found in MM1 and it was 77.16 mg/L due to the continuous input of industrial wastewater in this measuring point. Such results coincide with the research of Vasileska (2002), on Velgoshka River, where the high values are derived from the industrial waste water, communal water from households, and wastewater from agrarian areas. According to Dalmacija et al., (2011), ammonia is an indicator of pollution that occurred recently.

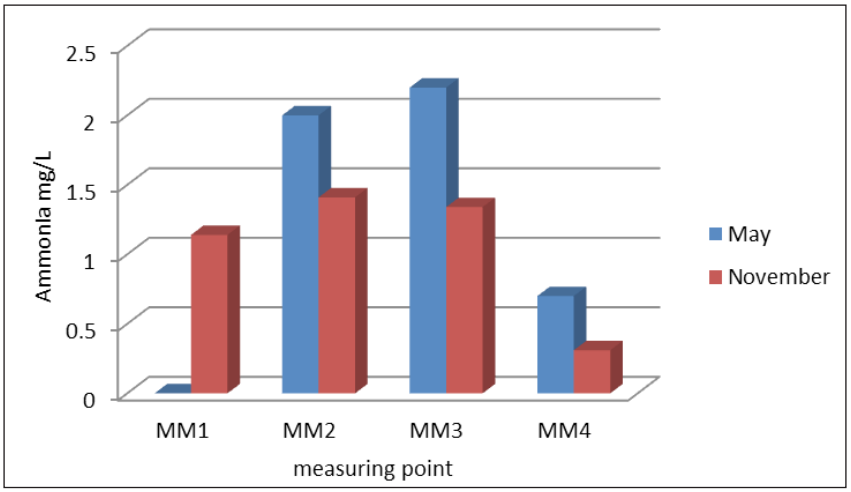

Figure 3. Ammonia content in water from the fifth channel and Crna Reka for May and November.

From Figure 3 it can be concluded that the highest values were found at the measuring point MM3 2.2 mg/L in May. The high content of ammonia in this measuring point is due to the continuous discharge of industrial wastewater, part of the faecal waters from the city of Bitola, faecal waters from the villages of Kravari and Egri. According to the Decree on Classification of Waters, the maximum permissible concentrations are exceeded. With the distances of the measuring points from the populated area and the value of the ammonia in the water it decreases to 0.34 mg/L in the MM4 of the River Crna. According to Blazevska (2016), the values of ammonia in the fifth channel are continuously high during the entire research period. With the distance from the settlements, the anthropogenic pressure decreases and consequently the ammonia content decreases.

The origin of nitrites in the water may be different: from degradable organic matter, from oxidation of ammonia to nitrites or as a result of reduction of nitrates (John, 2016).

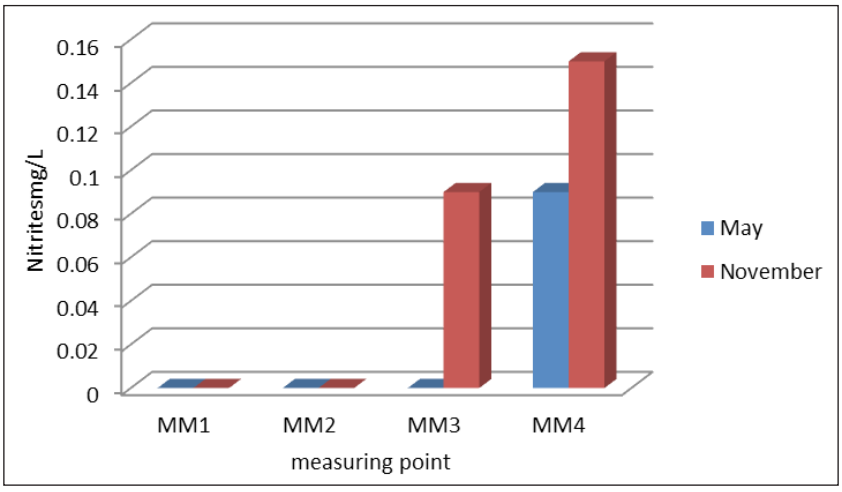

Figure 4. Content of nitrites in the water from the fifth channeland Crna Reka for May and November.

The high content of nitrites, which is most pronounced on MM4 (0.15 mg/L) in November (Fig. 4), is due to the intense decomposition of organic matter, as well as from the additional nitrites from the manure that comes to this measuring site with the rains. In MM1 and MM2 in the two months a value of 0.0 mg/L of nitrites was registered. And Milanovic (2007), examining the Vardar River at the Vardarobasi measuring point, explains the high values of 4.3 mg/L from the alochtonic input of nitrites originating from manure.

The following Figure gives the content of nitrates in the water from the fifth channel (Fig.5).

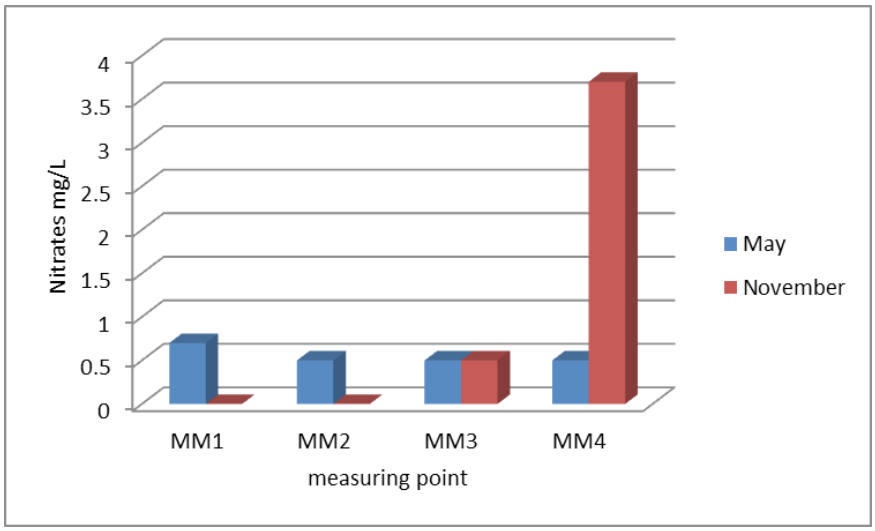

Figure 5. Content of nitrates in the water from the fifth channel and Crna Reka for May and November.

The high content of nitrates was found in MM4 3.7 mg L in November (Fig. 5), indicating that in this measuring point the degradation of organic matter is in the "final phase". According to Blazevska (2016), at this measuring point, the flow of waste industrial and communal water from the settlements and fertilizers used for fertilizing the agricultural crops, in the whole area of village of Kravari affect the increase in the nitrate concentration. In MM1 and MM2 where it was established value 0.0 mg/L for nitrites (Fig. 4), at the same measuring points the nitrate value (Fig.5) is the same (0.0 mg/L).

CONCLUDING REMARKS

From the conducted research of the water from the fifth channel and the Crna Reka, the following conclusions can be drawn: fifth canal, although it has low water capacity, yet the load that it makes with the waste organic matter on Crna Reka is large, close to the village of Kravari and Egri. The highest content of ammonia is recorded on MM3 whose value decreases with distances from settlements where the anthropogenic pressure is smallest. At the measuring point where the fifth channel flows into Crna Reka (MM4) the value of nitrates is the highest which indicates high degradation of organic matter.

Therefore, the results obtained from this research indicate that continuous cleaning of the channels and purification of industrial wastewater should be carried out before they are discharged into the rivers.

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СОДРЖИНАТА НА НЕОРГАНСКИ АЗОТ ВО ВОДАТА ОД ПЕТТИОТ КАНАЛ ВО БЛИЗИНА НА ГРАДОТ БИТОЛА

Татјана Блажевска[1*], Марија Менкиноска[1], Валентина Павлова[1], Зора Узуноска[1], Нина Димовска[2]

[1]Технолошко-технички факултет - Велес,Универзитет „Св. Климент Охридски" - Битола, Република Северна Македонија

[2]Агенција за храна и ветеринарство - Битола, Република Северна Македонија

**Контакт автор: tatjana.blazevska@uklo.edu.mk*

Резиме

Водата има важна улога во секојдневниот живот.Токму за тоа материјал за анализа беше водата долж течението на петтиот канал ММ1, ММ2, ММ3 и реката Црна - ММ4 по влевањето на каналот. Истражувањето беше спроведено во мај и во ноември. Беа направени следниве хемиски параметри: pH вредност со пехаметар, содржината на амонијак и нитрити во водата се одредува спектрофотометриски со Spectroqvant UV / VIS Pharo 300. Определување на нитрати со УВ пастел - алатка за директно читање на вредностите, потрошувачката на калиум перманганат се одредуваше со варење во кисела средина и титрација според Kubel-Tiemann. Од добиените резултати може да се констатира дека најголемо оптоварување со амонијак (2,2 mg/L) и нитрити има во мерното место ММ3, додека истите овие врености по влевањето на каналот во Црна Река се намалуваат. Една од препораките е спроведување на третман на прочистување на отпадните води.

Клучни зборови: *отпадна вода, комунална вода, загадување, животна средина.*