THE INFLUENCE OF THE RĂUT RIVER ON THE MINERALIZATION OF THE NISTRU RIVER WATERS (PERIOD OF YEARS 2015-2020)

Viorica GLADCHI

*Department of Industrial and Ecological Chemistry, Moldova State University, **Moldova***

The Dniester river is a cross-border watercourse, which streams from the Ukrainian Carpathians, starting near the border with Poland and reach the Republic of Moldova flowing through the eastern to the south part of the country. It forms a portion of Moldova's border with Ukraine to the northeast, then crosses the territory of the country, reaches again the border of Ukraine in the southeast and then flows into the Black Sea. The total length of the Dniester river is 1362 km, of which 657 km arewithin the Republic of Moldova's territory. The perimeter of the Dniester river basin area is about 19 thousand km^3 within the country, and the average of annual flow is 10.7 km^3. The Dniester river is the main water artery of the Republic of Moldova, its river basin occupies about 60% of the country's territory and represent the main source of drinking water for more than 1 million of the country's population. The waters of the Dniester are intensely polluted by sewage, municipal and domestic wastewater, negatively influencing to the river water quality. From the Dubasari dam accumulation reservoir to Chisinau, the Raut and Ichel tributaries flow into the Dniester at the right side of the river. Raut River is the largest tributary of the Dniester, with a length of 286 km and the water accumulation basin surface – 7,760 km^2. Within the basin of both above listed tributaries the large administrative points, industrial and agricultural objects are located. On the Raut river the cityBalti is located with a population of about 150 thousand people, where the city's treatment plant is discharging the suvage waters into the river. Apart from Balti, there are located some large localities such as Marculesti, Floresti, Orhei and others. The biggest part of the Raut basin on its course towards the Dniester captures the waters of the polluted streams from small rivers Copacianca, Cubolta, Cainari, Ciuluc, Cula, Cogalnic. Therefore, Raut flowing through many urban and rural localities, represent the additional sources of pollution due to the untreated wastewater discharge, sanitary protection areas uncontrolled grazing, significant anthropogenic impact on the main river, which poses a danger to the functioning of the aquatic ecosystem. In addition, these tributaries flow into the Dniester in the immediate vicinity of the water collection stations, which are conditioned and subsequently used for centralized water supply of Chisinau – the capital of the Republic of Moldova.

In order to have a complex and objective image of the Dniester river ecochemical state, as well as to assess theRaut impact were organized the seasonal hydrochemical expeditions during the years 2015-2020.The part of the Dniester river selected for observation lasted from the Dubasari dam, upstream from the Raut river to the Criuleni town at the Raut river downstream. During the years 2015-2020, the 27 hydrochemical expeditions in total were made. Downstream of the Dniester River, the essential changes in the formation of the chemical composition of the waters were identified. The hydrochemical water index indicates the dominant anion and cation changes in the water composition. Only 55% of the samples belong to the class of hydrogen carbonate water – typical for the waters with medium mineralization and for the Dniester in general. At the same time, over the 40% of samples indicate the phenomenon of chloride sulfate ions appearance as the main anion, or their competition with the traditional dominant anions – HCO_3^{3-}. Likewise, in about of 20% of samples as dominant cationsthe Na^+ and K^+ ions were identified, which determine the water group not characteristic for the Dniester waters. For this sampling point, a high correlation was identified between the

content of hydrogen carbonate ions and mineralization (r^2 = 0.70) and the content of chlorides and mineralization (r^2 = 0.60).

A reasonable correlation was found between the content of the main ions and the total hardness of the waters and between the content of hydrocarbons and hardness (r^2 = 0.50). The data obtained indicate the total hardness values increasing of the Dniester waters after the Raut river flows into it. Higher values of water hardness were recorded in 2015, 2016 and 2019, as well as in the Dniester upstream Raut sampling point. In general, after the Raut river flows into the Dniester, its water hardness increases by about 13%, which confirms the negative influence of the tributary to the main river.

The same trend is observed for the water mineralization annual average values. The results obtained indicate increasing by almost 40% the water mineralization average in the sampling point on the Dniester downstream of the river Răut compared to the samples collection point on the Dniester upstream of the Răut. Moreover, during the monitoring period it was observed the change of ratio between the main ions equivalent content in the Dniester after the discharging of the Răut river. The analysis of the data obtained shows a significant increase in the share of chlorides (2.6 times) and monovalent cations (1.6 times) in the Dniester waters after the discharging of the Raut river, due to the more obvious decrease of Ca^{2+} ions (by 25 %) in the weight and hydrogen carbonates (by 22%). This phenomenon is related to the penetration into the Dniester thepolluted water with household waste and untreated or poorly treated domestic and municipal waters.

Therefore, the waters of the Răut significantly influence the content and distribution of the principal ions, as well as the hydrochemical index of the waters of the Dniester river.