PHYSICOCHEMICAL ANALYSIS OF THE COLLECTED WATER SAMPLES FROM MOLDOVA NOUĂ AREA – AUTUMN SAMPLING (15.10.2020)

The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. Natural water contains different types of impurities are introduced in to aquatic system by different ways such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere and from several human activities, including mining processes. Some physical test should be performed for testing of its physical appearance such as temperature, color, odour, pH, turbidity. For obtaining more and more quality and purity water, it should be tested for its trace metal and heavy metal contents. It is obvious that drinking water should pass these entire tests and it should content required amount of mineral level. Different physicochemical parameters are tested regularly for monitoring quality of water [1, 2].

In this report, the chemical analysis includes *in situ* analysis (pH, turbidity, conductivity, dissolved oxygen) and *ex situ* (in-laboratory analysis) as the content of different metals, for different locations (rivers, wells) from the Moldova Noua area (Romania). The concentration results of heavy metals and other elements such as Cu, Zn, Mn, Mo, Cr, Fe, Cd, Pb, As, Ni, Se, and S were evaluated. All parameters and results obtained were compared with the safe limits set by World Health Organization (WHO) and National Drinking Water Quality Standard (NDWQS).

PHISICOCHEMICAL PARAMETERS ANALYSIS

All samples (Table 1) were collected and parameters were examined according to the *Sample collection procedure,* established in the project. The chemical analysis was realized at the Institute of Mines and Metallurgy Bor, Serbia. These investigations were performed using an ICP-OES system (Inductively Coupled Plasma Optical Emission Spectrometer), the new equipment purchased in this project. *In situ*, the parameters were measured using a portable multimeter (pH, conductivity, dissolved oxygen), a turbidimeter (turbidity), and a thermometer (air, water, and soil temperature). The location parameters as latitude, longitude and altitude were identified using the *Altimeter* application.

Table 1. Sampling points in the Moldova Nouă area, Romania.

Sample ID	Location name of the sample
W18-c	Boșneag River (Moldova Veche)
W19-c	Boșneag River (upstream Moldova Veche)
W20-c	Radimna River (Pojejena)
W21-c	Radimna River (upstream Pojejena)
W22-c	Nera River (Socol)
W23-c	Nera River (upstream Socol)
WU11-c	Well from village of Coronini, near the pond Boșneag
WU12-c	Well from village of Moldova Veche, near the pond Boșneag
WU13-c	Well from village of Macesti
WU14-c	Well from city of Moldova Noua
S82-c	Sediments from W18 location (Bosneag River)
S83-c	Sediments from W19 location (Radimna River)
S84-c	Sediments from W20 location (Nera River)
S85-c	Soil near Bosneag tailings pond
S86-c	Soil at 200 m in Bosneag tailings pond (N-W direction)
S87-c	Soil at 400 m in Bosneag tailings pond (N-W direction)
S88-c	Soil at 600 m in Bosneag tailings pond (N-W direction)

Measurement of pH relates to the acidity or alkalinity of the water. pH is classified as one of the most important water quality parameters. A sample is considered to be acidic if the pH is below 7.0, while if the pH is higher than 7.0 the sample is alkaline. Acidic water can lead to corrosion of metal pipes and plumbing systems. The alkaline water shows the presence of disinfectants in water. The normal drinking water pH range mentioned in the WHO and NDWQS guidelines is between 6.5 and 8.5/9.0.

The pH values of all the drinking water samples are found to be in the range between 6.7 and 8.07 (Figure 1, A, B) where the lowest and highest values are from WU14 (Well from city of Moldova Noua) and W19 (Boșneag River (upstream Moldova Veche). According to WHO and NDWQS the pH from all samples of water is within the recommended limits. The blue lines represent the accepted limits of WHO and NDWQS, for the pH of rivers and wells.
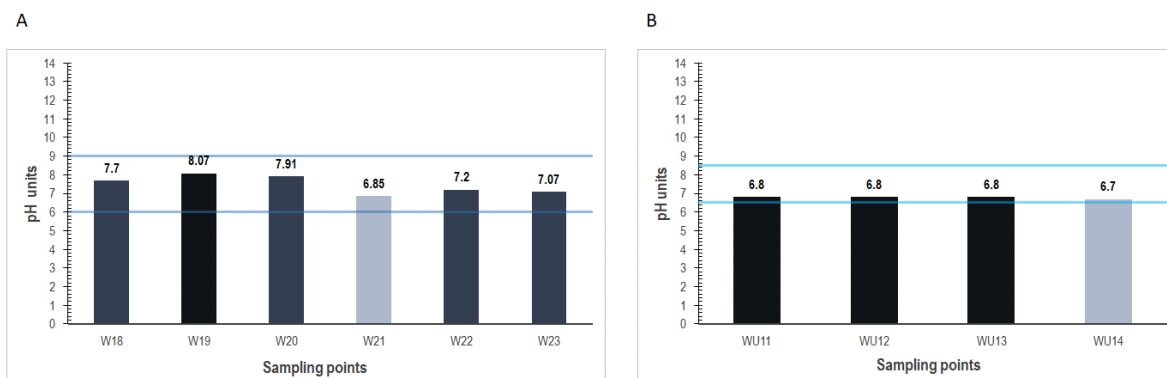
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*Figure 1. **pH** values of water samples collected in 15.10.2020. (A) Samples collected from rivers, (B) Samples collected from wells. WU11-c = Well from village of Coronini, near the pond Boșneag, WU12-c = Well from village of Moldova Veche, near the pond Boșneag, WU13-c = Well from village of Macesti, WU14-c = Well from city of Moldova Noua, W18-c = Boșneag River (Moldova Veche), W19-c = Boșneag River (upstream Moldova Veche), W20-c = Radimna River (Pojejena), W21-c = Radimna River (upstream Pojejena), W22-c = Nera River (Socol), W23-c = Nera River (upstream Socol).*

HEAVY METALS ANALYSIS

The presence of heavy metals in water higher than a certain concentration can cause detrimental impacts on human health. Therefore, the analysis of heavy metals is an important parameter. In the present study, the concentration results of heavy metals and other elements such as Cu, Zn, Mn, Mo, Cr, Fe, Cd, Pb, As, Ni, Se, and S from different samples of water (rivers and wells), sediments, and soil in the Moldova Noua area, are highlighted in Table 2.Table 2 All parameters and results obtained were compared with the safe limits set by the World Health Organization (WHO) and National Drinking Water Quality Standard (NDWQS). Only W22 (Nera River (Socol) and W23 (Nera River (upstream Socol) samples showed a concentration of Fe, over the limit. All the other samples show concentrations in the range accepted by WHO/NDWQS.

Table 2. Interpretation of chemical results for every metal/nonmetal identified in water samples (Moldova Noua) [3].

Metal/ Nonmetal	Minimum concentration identified (µg/L)	Sampling location	Maximum concentration identified (µg/L)	Sampling location	WHO/ NDWQS limit range (µg/L)
Cu	12.8	WU11	95.5	W18	50-1500
Fe	167.8	WU14	1030.8	W22	200-300
Zn	6.2	W14, W23	54.9	W1	1000-3000

Cd	0.1	WU11–WU14, W19-W23	0.39	W18	1-5
Cr	1.7	WU12-WU14 W18-W23	4.5	WU11	40-50
Pb	2.1	WU11–WU14, W19-W23	3.7	W18	5-10
As	2.1	WU11–WU14, W20-W23	3.7	W19	7-10
Ni	3.6	all	3.6	all	10-20
Mn	1.6	WU12-WU14	58.3	W18	50-100
Mo	0.50	W12, W13, W20, W22, W23	21.4	W19	50-70
Se	4.5	all	4.5	all	7-10
S	7200	W22	98600	W19	50000-250000

CONCLUSIONS

The values of water quality parameters such as pH, conductivity, turbidity, and dissolved oxygen from all samples collected from different rivers, wells and soil from Moldova Noua areas were found to be within the recommended limits of WHO and NDWQS. The concentrations of 10 heavy metals (Cu, Zn, Mn, Fe, Cd, Pb, Cr, As, Mo, and Ni) and 2 nonmetals (Se, S) were also measured and found to be below the standard maximum concentrations accepted. Therefore, the quality of wells and even rivers water is good in area of Moldova Noua, excepting the W22 (Nera River (Socol) and W23 (Nera River (upstream Socol) samples which showed a concentration of Fe, over limit. For a detailed analysis of water quality in Moldova Noua area, the monitoring and analysis will be carried out for a longer period of time (every season).

REFERENCES

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