CHEMICAL ANALYSIS OF SHALLOW GROUNDWATERS FROM SAG, TIMIS COUNTY

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Abstract: *Water is an important factor in ecological balances and its pollution is a current problem with consequences more or less serious on the population. Safe drinking water is essential to humans and other life forms even though it provides no calories or organic nutrients. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation. Some observers have estimated that by 2025 more than half of the world will be facing water-based vulnerability. A recent report suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%. Water plays an important role in the world economy as it functions as a solvent for a wide variety of chemical substances and facilitates industrial cooling and transportation. Approximately 70% of the fresh water used by humans goes to agriculture. By water pollution, we usually understand impairing the physical, chemical and biological characteristics, produced directly or indirectly by human activities, and that makes the waters to become unsuitable for normal use in the purposes for which such use was possible before interfering altering. In this paper we analyzed surface waters in order to determine its pollution degree. The main pollution factors in area are human agglomerations, industry and agriculture. Samples were taken in the village Sag, Timis county where agricultural pollution sources are considered most important. The parameters analyzed were pH, content of nitrates, nitrites, ammonia and heavy metals.Water samples analysis were made in the Soil Science laboratory from USAMVBT. pH was determined by potentiometric method, nitrates, nitrites and ammonia content by colorimetric method and heavy metals trough atomic absorption spectrometry. Exceeding the maximum limits in surface waters was determined for nitrate and ammonium. Heavy metal content has recorded values above limits.*

Key words: *nitrate, heavy metals, pollution, water*

INTRODUCTION

"Surface waters" means internal waters, except groundwater, transitional waters and coastal waters and, in respect of chemical status, territorial waters. (UE DIRECTIVE 2000/60)

Water is of particular biological importance for all living organisms is the basis of their structural and functional. In the body, water occurs in three forms: intracellular, interstitial and circulating. Water is one of the main environmental factors alongside air and soil.

In agriculture there is a growing trend in the volume of water consumed, due to intensive agriculture and the expansion of irrigated areas because of the global warming and desertification phenomena.

"Good chemical status of surface water" means the chemical status required to achieve specific environmental objectives proposed and pollutant concentration values should not exceed the environmental quality standards laid down in the EU laws (UE DIRECTIVE 2000/60).

Water pollution, especially of the surface waters, is currently a major issue globally and will increase because of the third world cities is growing rapidly without adequate sanitation, chemical industry, agriculture, mining and others with a negative impact on the environment (BRANZEI ET ALL. 2005).

The process of eutrophication is their enrichment in nutrients, leading to overgrowth of aquatic plants and algae in particular. The first phase occurs increasing the amount of oxygen in the course of photosynthesis, then it decreases the oxygen consumed by microorganisms that occur in the decomposition of organic matter. When the amount of oxygen becomes insufficient anaerobic decomposition processes taking place with evolution of toxic chemical compounds such as methane, ammonia and hydrogen sulphide.

Nutrient enrichment of the water determines the successive and profound changes in the structure of ecosystems, leading to degradation of biocenosis and finally to its deterioration.

In this paper we analyzed surface waters in order to determine its pollution degree. The main pollution factors in area are human agglomerations, industry and agriculture. Samples were taken in the village Sag, Timis county where agricultural pollution sources are considered most important. The parameters analyzed were pH, content of nitrates, nitrites, ammonia and heavy metals.

MATERIAL AND METHOD

Samples were taken from shallow groundwater (wells with water depth ranging from 5 to 10 meters) in the town of Sag, Timis county in 11.2012.

From each location had been taken three water samples from different places in order to have a correct appreciation of the nitrate level.

Samples taken for nitrate determination was collected in a glass bottle and stored below 5˚C in order to prevent any possible reduction of nitrate to nitrite by microorganisms. Water samples were first filtered through filter paper.

pH was determined by potentiometric method. Nitrates and nitrites content by colorimetric method with a spectrophotometer Cintra 101 at wavelength 410 nm for nitrate and 540 nm for nitrite.

Heavy metals were determined trough atomic absorption spectrometry with VARIAN FAAS 220 spectrometer.

RESULTS AND DISCUSSIONS

Has been set maximum nitrate content in drinking water, 44 mg or 50 mg NO_3/liter according to WHO and NO_3/liter by EU standards (DIRECTIVE 92). Between 50 and 100 mg / liter, the alert threshold is reached, because once the excess of 100 mg / liter, the water to be declared unfit for consumption (MIHAIESCU ET.ALL, 2010).

When nitrates are present, community water prints a bitter taste and are a threat to human health, especially for children, they can cause methemoglobinemia known as "blue blood disease" that can lead to their death.

Following investigations, it was determined, in 11.2012, NO3-content in the range of 45.8 to 275 mg NO_3^-/ l This exceeds the maximum allowable content in all three sampling points.

The high NO_3^- produced originates most likely from septic tanks properly obsolete and the application of chicken manure, known for its high nitrogen content, the gardens located near the wells.

Nitrites in water appear in a more advanced stage of the process of mineralization of organic matter under the action of nitrifying bacteria by oxidizing ammonia. Groundwater may have a high content of nitrite than the surface in the case of nitrite from nitrate reduction.

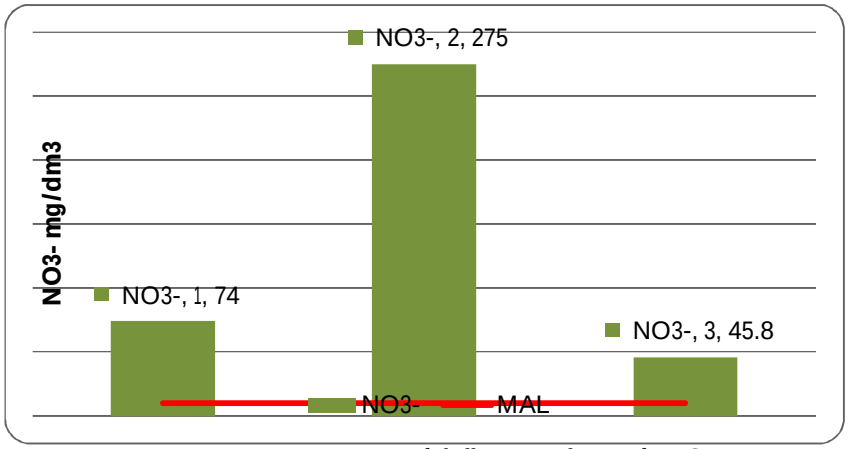

Fig.1.Nitrate content of shallow groundwaters from Sag

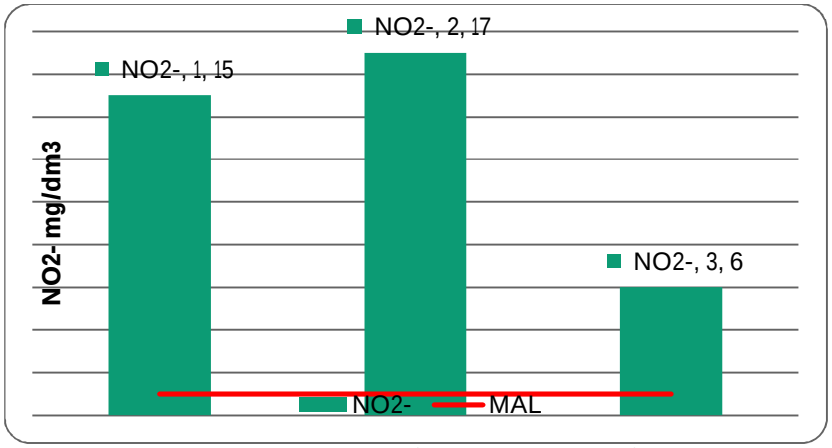

Fig.2.Nitrite content of shallow groundwaters from Sag

The content of NO_2^-, water shallow fret Sag the town has more than the maximum permissible values in all three sampling points, which are within the range 6-17 mg NO_2^-/ L.

The large quantity of nitrates in the water can be derived from the reduction of nitrate ion or the ammonium ion incomplete nitrification applied in the form of organic or mineral fertilizers (FLESERIU AND OROIANU, 2010) .

The determined values of the content of copper is between 0.02 to 0.11 mg Cu^{2+}/ L. Exceeding the maximum allowable 0.05 mg Cu^{2+}/L lies sample 3 in 11.2012 sampling period.

The copper content of the water can be drawn from the soil by leaching of copper salts containing rocks. It is known that in Banat soil is rich in this trace element and from soil copper through cation exchange process can get into the water.

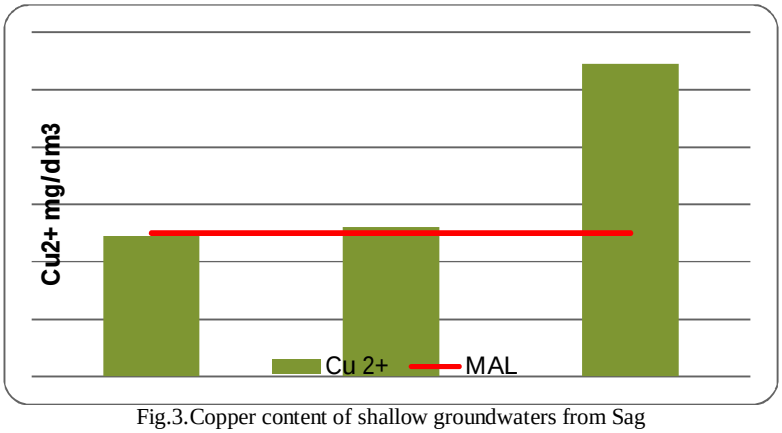

Fig.3.Copper content of shallow groundwaters from Sag

Table 1

Manganese and zinc content of shallow groundwaters from Sag

sample	Mn mg/dm3	Zn mg/dm3
1	1,372	0,0434
2	SLD	0,2626
3	SLD	0,1672

The shallow groundwater manganese can reach leaching processes, MAL Mn^{2+} was 0.1 mg/L. The products rich in organic matter (compost, manure) are rich sources of manganese water. Just as in the case of iron, manganese oxides may change the color of the water. Manganese content exceeds MAL in the sampling point 1.

Zinc content in shallow groundwater is between 0.04-0.26 mg Zn^{2+}/L, values exceeding MAL of 0.05 mg Zn^{2+}/L. High amounts of zinc may originate from processes minerals from soil erosion, especially after applying fertilizer galvanized corrosion installations.

Table 2

Cadmium, iron, nikel and lead content of shallow groundwaters from Sag

sample	Cd ppm	Fe ppm	Ni ppm	Pbppm
1	SLD	0,030	0,001	SLD
2	SLD	0,024	0,040	SLD
3	SLD	0,092	0,060	SLD

In cadmium, iron, nikel and lead the determined values does not exceed maximum admitance level in non of the prelevation points.

CONCLUSIONS

Concerning nitrate and nitrite content shallow groundwater in the town of Sag, Timis, falls into the third category of quality.

In terms of copper content, only the second and third sampling point is exceeded the maximum limit, sample 1 fits in firs class quality.

Regarding the content of heavy metals, due to the lack of major sources of pollution, studied waters shows low levels of these pollutants.

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