

RESEARCHES CONCERNING DEEP AND SURFACE WATER QUALITY FROM RURAL LOCATIONS NEAR TIMISOARA AREA

CERCETĂRI PRIVIND CALITATEA APELOR DE SUPRAFAȚĂ ȘI ADÂNCIME DIN LOCALITĂȚILE RURALE LIMITROFE TIMIȘOAREI

*ALEXA ERSILIA, COZMA ANTOANELA, LAZUREANU A.,
NEGREA MONICA*

Banat's University of Agricultural Science Timisoara

Abstract. *This study has in view the monitoring of the contamination of deep and surface groundwater from villages coterminous to Timisoara county establishing correlations between the level contents of nitrogen, chlorines, sulphates and phosphates compounds and geomorphological, pedological, climatic conditions of analysed areas as well as agrozootechnical activities. There was analysed 10 points of prelevation, experimental results indicating an increase of the content of nitrogen, chlorines, sulphates and phosphates compounds in the prelevation points located in the neighbourhood area of the house wastes deposition.*

Rezumat. *Studiul de față a urmărit monitorizarea contaminării apei freatică de suprafață și adâncime din localități rurale învecinate municipiului Timisoara, stabilindu-se corelații între nivelul conținutului de compuși cu azot, cloruri, sulfati și fosfati, în apa freatică și condițiile geomorfologice, pedologice și climatice ale zonei analizate, precum și activitățile industriale și agrozootehnice practicate în arealul analizat. Au fost analizate 10 puncte de prelevare, rezultatele experimentale indicând o creștere a conținutului de compuși cu azot, fosfati, cloruri și sulfati în punctele de prelevare situate în arealul deponeului de reziduuri menajere.*

The environmental pollution, knowing the disturbing factors of the ecological equilibrium and the working out of the strategies concerning the reduce of biotic contamination factors representing prior topics of the interdisciplinary research (agriculture-ecology-chemistry) promoted at a national and international level in the domain of the environment protection. In this way, the monitoring of the quality of the ground waters and the establishment of the causes which lead to their pollution represents a special scientific and practical interest.

The International Organization of Health stipulates a limit interval for a series of substances and from this one they can adopt different countries standards expressed by maximum concentration admitted [4]. In our country, actual differential quality standards depending on nature of water, surface, irrigation or underground waters. The underground waters have in general a composition close to the drinking water needs, except their loading with mineral elements, presenting at the same time small variations in their composition. Unlike the underground waters, the surface waters lack of any

natural protection, are intensely polluted, and the concentrations variation of the different chemical substances are very big.

This study had in view the monitorization of the surface and deep groundwater contamination from the rural locations coterminous to Timisoara, analysing 10 points of prelevation, for which the content of nitrogen, chlorines, sulphates and phosphates compounds were determined.

MATERIAL AND METHOD

To monitoring the quality of the surface and deep groundwater 10 samples of particular fountain and drillings water have been prelevated in the locations situated at a distance of 5-10 km on the SW direction from Timisoara. There were analysed both drillings situated in the immediate neighbourhood of the house wastes deposition which serve the Timisoara city (prelevation points 1-3), and those coming from the village fountains located in Sanmihaiul Roman, Utvin, Parta (prelevation points 4-7), the drilling depth being of 5-10 m. There was also analysed the depth ground water stratum (prelevation points 8-10) situated at a bigger than 20 m depth and which represents the centralised drinking water source, supplied by the councils of the investigated locations.

The water samples were prelevated in four stages along the 2006 year.

The prelevation and stocking of the water samples were done according to SR ISO 5667-10, SR ISO 2852. The determination of the chlorides has been done according to the Standard SR ISO 9297/01 [6]. The determination of the phosphates has been done according to the SR-EN 1189-2000 [7] standard. The content of nitrates, nitrites and ammonium was determined colourimetrically using quick tests AQUA MERCK, at the spectrophotometre SQ 118 at the length : 515, 525 și 690 nm for nitrates, nitrites and ammonium. The used tests were SPECTROQUANT NITRATE 14773, SPECTROQUANT NITRITE 14776 și SPECTROQUANT AMMONIUM 14752. The determination of the sulphates has been done according to the Standard USA 95 method. [5]

RESULTS AND DISCUSSIONS

The analysis of the obtained experimental results are presented in tables 1-7. The analysis of the obtained experimental results points to the fact that the exceeding of the maximum admitted limit, related to the 0,5 mg/l ammonium drinking water is recorded in 2006 in two of the analysed samples, in Sanmihaiul Roman 0,7 mg/l and the taken water samples from the drilling F3 situated in the immediate neighbourhood of the house wastes deposition [1-2].

Table 1

The analysis of the organic and anorganic chemical compounds from the 1 drilling point, PARȚA

Analysed compound	Month				CMA (mg/l)
	January	April	July	October	
Ammonium	0,26	0.32	0.08	0.12	0,5
Nitrate	0,45	0.2	0.02	0.06	0,5
Nitrite	9,51	36.1	16..9	5.8	50
phosphate	1,13	0.44	0.8	0.04	0,5
Cloride	42,3	32.4	54	24.1	250
Sulfate	24,5	25.1	94	20.0	250

Table 2.

The analysis of the organic and anorganic chemical compounds from the 2 drilling point PARȚA

Analised compound	Month				CMA (mg/l)
	January	April	July	October	
Ammonium	0,4	0.3	0.4	0.2	0,5
Nitrate	0,45	0.15	0.1	0.05	0,5
Nitrite	12,2	21.5	1.8	3.4	5
phosphate	1,10	0.5	1.9	0.04	0,5
Cloride	23,3	14.2	19	22	250
Sulfate	34,5	22.4	20	1.6	250

Table 3.

The analysis of the organic and anorganic chemical compounds from the 3 drilling point Sânmihaiul Roman

Analised compound	Month				CMA (mg/l)
	January	April	July	October	
Ammonium	0,7	0.02	0.5	1.4	0,5
Nitrate	0,35	0.1	0.08	0.69	0,5
Nitrite	10,4	1.75	4.5	0.67	50
phosphate	0,5	0.1	0.1	0.06	0,5
Cloride	45	53	25.6	19.4	250
Sulfate	32,1	164	120	16..3	250

Table 4.

The analysis of the chemical compounds from the 4 drilling point Utvin

Analised compound	Month				CMA (mg/l)
	January	April	July	October	
Ammonium	0,02	0.05	0.4	0.2	0,5
Nitrate	0,03	0.02	0.1	0.03	0,5
Nitrite	4,5	15.6	26.5	10.8	50
phosphate	0,5	0.5	0.2	0.4	0,5
Cloride	25	42	15.4	19.8	250
Sulfate	11,4	26.3	10.5	30.4	250

Table 5.

The analysis of the chemical compounds from the 5 drilling point,
near to deposition

Analysed compound	Month				CMA (mg/l)
	January	April	July	November	
Ammonium	1.2	1.8	0.9	0.5	0,5
Nitrate	0.9	0.6	0.3	0.4	0,5
Nitrite	15.5	28.9	25.5	6.3	50
phosphate	0.9	0.8	0.4	0.05	0,5
Cloride	7.1	7.0	7.1	7.2	6,5-8,5
Sulfate	281	254	125	87	250
Ammonium	144	120	106	52	250

Table 6.

The analysis of the chemical compounds from the 6 drilling point, near to deposition

Analysed compound	Month				CMA (mg/l)
	January	April	July	October	
Ammonium	0.5	0.7	0,2	0.3	0,5
Nitrate	0.4	0,05	0,08	0,3	0,5
Nitrite	25,5	23.5	11.25	10.5	50
phosphate	2.5	1.2	1.7	1.0	0,5
Cloride	7,0	6.68	7,0	6.8	6,5-8,5
Sulfate	68.7	51.2	45.3	87.5	250
Ammonium	125	65.4	58.2	69.5	250

Table 7

The analysis of the chemical compounds from the 7 drilling point, near to deposition

Analysed compound	Month				CMA (mg/l)
	January	April	July	October	
Ammonium	0.02	0.1	0.1	0.2	0,5
Nitrate	0.5	0.6	0.5	0.5	0,5
Nitrite	4.8	8.5	10.5	9.51	50
phosphate	2.1	1.25	0.5	0.5	0,5
Cloride	7.0	7.2	7.0	6.8	6,5-8,5
Sulfate	125.3	42.7	87.5	104	250
Ammonium	89	75.4	102	90.2	250

The contents of nitrites exceeds the 0,5 mg/l maximum admitted limit at the F3 and Sanmihaiul Roman drilling too [3]. The content of nitrates are framed in the admitted limits.

As far as the evolution of the nitrogen compounds content depending on seasons, is viewed, the highest values are recorded in the winter and autumn months when the level of the rainings is high, that favourizes the levigation of the nitrogen compounds and their accumulation in the ground water.

The lack of the vegetation that absorbs radically the nitric nitrogen in this period of the year also determines the increase of the contamination.

◆ The content of phosphates is supplementary, exceeding the maximum admitted limit of 0.5 mg/l in a proportion of 42,85% from the analysed samples. The drillings located in the neighbourhood of the house wastes deposition recorded the highest values in view phosphates contents. The phosphates increasing is the cause by the decomposing of the organic substances after the leaking of the agricultural products, detergents or excreta, this increasing being proportional with the quality of the deposited wastes.

◆ The chlorides usually have concentrations under 10mg/l in unarid regions. The taste of water is salty at concentrations over 100 mg/l g. The water with excesses of chlorides is not adequate for human usage, having bad effects in health. The maximum content of chlorides admitted is that of 250 mg/l, this value being exceeded in 2006 in a proportion of 16,6%, at one of the drillings from house wastes deposition neighbourhood. His increasing is caused by the industrial pollution and from excreta.

◆ The sulphates are present in concentration bellow 1000 mg/l in waters. Concentrations over 250 mg/l are not admitted to be used in industry. In 2006 haven't been registered extra values at this parameters.

Maximum values admitted were reported for the drinking water for which only the toxic effect and organoleptic one taken into consideration. For the surface waters the ecological and biological criterium appears as very important, especially according to the influence over the capacity of selfpurification of water. On this basis, the standards of different usage of categories, are strictly applied to the place of use and don't include large territories or entire rivers even if their lenght is short.

◆ The quality of the levigated chemical compounds in the groundwater depends on the structural soil characteristics. The soil structure in the deposition area, done profile of 13 m depth, indicates a structure of half permeable rock of type : dusty, clay, sandy clay, and dusty sandy clayey ones, and the stratum which carries the water is very sandy, waterless, a mixture of small stones, sandy but dusty clays. The levigation intensity, increases together with the sand and small stones fraction in the soil, being stopped by the clayey stratum of the soil. Medium values regarding the quantity of nitrogen compounds in the ground water stratum of the deposition is in accordance with geological structure of the soil, which is partially permeable for the nitrogen chemical contaminants.

◆ The depth analysed drillings, done by the local councils which supply the necessary drinking water, centralised at the rural locations level are framed between normal limits of the analysed parametres.

CONCLUSIONS

This study regarding the quality of the ground water in the Timisoara neighbourhood rural area, which includes the agricultural zone, particular drillings in the nearby houseworks, but also the house wastes deposition, lead to the following conclusions:

◆ Particular drillings in the analysed area in which intense agriculture is practised, as well as from the houseworks which didn't respect the standards of protection of water sources, record exceeding of the maximum admitted limits as far as the nitrogen compounds are viewed;

◆ The phosphates and chlorides content is exceeding especially in the house wastes deposition neighbourhood. The increase of the phosphates content is caused by discomposition of the organic substances after the impurification with agricultural products, detergents and offals, this increase being proportional with the quantity of the deposited wastes;

◆ The content of the sulphates doesn't exceed the maximum admitted limit of 250 mg /l in the industrial usage.

◆ The interpretation of the chemical compounds values depending on the rainings quantity points an increase of the levigation capacity and infiltration, in the ground water, of the nitrogen compounds as well as of phosphates and sulphates together with the increase of the raining quantity.

◆ The quantity of levigated chemical compounds in the ground water depends also on the structural characteristics of the soil being in concordance with the geological structure of the soil, made up of waterproof rocks like dusty, sandy, clay, clayey dusts partially permeable for the analysed chemical contaminants.

REFERENCES

1. **Cozma Antoanela, Alexa Ersilia, Lazureanu A., Poiana Mariana, Peev Camelia**, 2006 - *The effect of waste deposition in the nearby Timisoara on deep and surface waters pollution*. Proceedings of the 13th Symposium on analytical and environmental problems, Szab, Szeged, Hungary, 25 September.
2. **Cozma Antoanela, Lazureanu A., Alexa Ersilia**, 2005 - *Study regarding the waste of pesticides and nitrogen compounds from the ground water taken in the Sag-Parta area*. Scientific Researches, IX, Ed. Agroprint Timisoara.
3. **Cozma Antoanela**, 2007 - *Cercetari privind contaminarea apelor de suprafata si adancime cu deseuri provenite din deponeul Sag-Parta, judetul Timis*. Teza de doctorat, U.S.A.M.V.B.T.
4. *** Legea 458 2002 - *Legea privind calitatea apei potabile*.
5. *** SR USA - 95 *Determinarea conținutului de sulfați*.
6. ***SR ISO 9297/ 01 - *Determinarea conținutului de cloruri*
7. ***SR EN 1189/2000 - *Determinarea conținutului de fosfați. Metoda spectrometrică cu molidat de amoniu*.