MONITORING OF THE SPRING WATER IN NUFARUL DISTRICT FROM ORADEA, USED LIKE DRINKING WATER

Petrehele Anda Ioana Grațiela*, Fodor Alexandrina*, Purcarea Cornelia, Chiş Adriana****

**University of Oradea, Science Faculty, Chemistry Department, 1 Universitati St., 410070 Oradea; Romania, andapetrehele@rdslink.ro*
***University of Oradea, Faculty of Environmental Protection, 26 gen. Magheru St., 410048 Oradea; Romania*

Abstract
In this paper we proposed to analyse the composition of spring water in Nufarul district from Oradea. The problem interest us is the quality of this water for drinking and cooking, because this is used frequency by the population from this district for those. Our analyses were driving in three directions: microbiologic, physic and chemic. The evolution of parameters were following for five month, between February-2009 and June -2009, for three collected samples by month. We were according attention to the influence of meteoric influence to the quality of water, like snowing, raining. The paper wants to grow up a special attention in the using like drinking water of anything spring not disinfected or polluted through different modes.

Key words: Drinking water, spring water, Mycrobian Species, physic parameters, chemic parameters

INTRODUCTION

Essential to the survival of all organisms, water has historically been an important and life-sustaining drink to humans (Rădulescu, 2003). Excluding fat, water composes approximately 70% of the human body by mass (Ciarnau, 2000). It is a crucial component of metabolic processes and serves as a solvent for many bodily solutes. Water is an essential part of all living systems and is the medium from which life evolved and in which life exist (Manahan, 2000; Shiklomanov, 2000).

A reasonable definition of a pollutant is a substance present in greater than natural concentration as a result of human activity that has a net detrimental effect upon its environment or upon something of value in that environment (Burtică et al., 2005). Contaminants, which are not classified as pollutants unless they have some detrimental effect, cause deviations from the normal composition of an environment (Manahan, 2001; Gârban, 2000).

Thus, chemical analysis is a vital first step in environmental chemistry research. The difficulty of analyzing for many environmental pollutants can be awesome (Negoianu and Goldfarb, 2008).

We effectuated a lot of quantitative determinations of the mycrobian species, the physic and chemic parameters of the spring water in Nufarul district from Oradea in conformity with normative for our country and all the data were recorded and analysed by us.

MATERIALS AND METHODS

All chemicals were commercially available, of reagent grade quality and used as received. In all synthesis and studies bidistilled water was used. All the determinations are

in conformity with our country normative and are remembered in the next tables (Law no. 459/2002; Ray and Young, 2001).

The microbiologic determination effectuated in a microbiology lab from our University in conformity with special normative conditions (Law no. 459/2002).

RESULTS AND DISCUSSION

The mycrobian species finding in spring water from Nufarul are recorded in the next table and graphic.

Table 1

Variation of the mycrobian species from february 2009 to june 2009

	Mycrobian Species	Normal limited	Normative documents	Feb.2009 After raining	Mar.2009 After raining	Apr.2009 After raining	May 2009	June 2009
1	Total Coliform (no/100 ml)	0	SR EN ISO 9308-1	130	23	240	186	49
2	Intestinaly Enterococ (no/100 ml)	0	SR EN ISO 7899-2	5	0	17	0	0
3	Escherichia Coli (no/100 ml)	0	SR EN ISO 9308	0	0	0	0	0
4	Bacteries at 37 ºC (no/cm^3)	≤20	SR EN ISO 6222	> 300	150	65	23	10

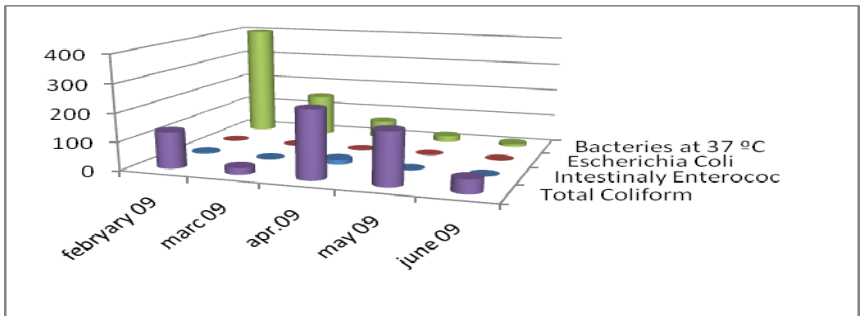

Fig 1. Variation of the mycrobiological species between February 2009 and June 2009 in different atmosphere condition

The next data from tables show a lot of the characteristics for the spring water by Nufarul district from Oradea, month after month, from February 2009 to June 2009. Three water spring samples were collected and analysed in every month, in different atmosphere conditions.

Table 2

Variation of physic and chemic parameters in spring water from Nufarul in February 2009

	Article I. P arameters	1-10 february 2009 After snowing	11-20 february 2009	20-28 february 2009	Normal values Law458/2002	Analysis method
1	Taste	Normal	Normal	Normal	Normal	SR EN 1622/2000
2	Smell	Normal	Normal	Normal	Normal	SR EN 1622/2000
3	Colour	Normal	Normal	Normal	Normal	ISO 7887/97
4	Turbiditity	12,5	10,5	8,3	≤ 5	SR EN ISO 7027
5	pH	5,7	5,8	5,9	6,5-9,5	SR ISO 10523
6	NH_4^+ (mg/l)	0,14	0,10	0,07	≤ 0,5	SR ISO 7150/1/01
7	NO_3^- (mg/l)	18,5	19,0	18,7	≤ 50	SR ISO 7890-1

8	NO_2^- (mg/l)	0,023	0,018	0,015	≤ 0,5	SR 3048-2
9	Ca^{2+} (mg/l)	48	49	50,5	≤ 100	STAS 3662/90
10	Cl^- (mg/l)	10,25	10	9,50	≤ 250	SR ISO 9297/01
11	Total durity	8,06	8,55	9,10	≥ 5	STAS 3026/76
12	Iron (mg/l)	0,127	0,110	0,100	≤ 0,2	SR ISO 6332/96
13	Mg^{2+} (mg/l)	5,83	7,2	8,8	≤.50	STAS 3662/90
14	Alcalinity	1,7	1,8	1,9		SREN ISO9963/1
15	HCO_3^- (mg/l)	114,6	114	113,7		SREN ISO9963/1
16	CCO-Mn (mg/l)	6,63	4,02	2,55	≤5	SR EN ISO 8467
17	Conductivity (µS/cm)	357	360	372	≤2500	SR EN 2788

Table 3

Variation of physic and chemic parameters in spring water from Nufarul in March 2009

	Article II. Parameters	1-10 March 2009 After raining	11-20 March 2009 After raining	20-31 March 2009	Normal values – Law 458/2002	Analysis method
1	Taste	Normal	Normal	Normal	Normal	SR EN 1622/2000
2	Smell	Normal	Normal	Normal	Normal	SR EN 1622/2000
3	Colour	Normal	Normal	Normal	Normal	ISO 7887/97
4	Turbiditity	1,53	4,68	2,23	≤ 5	SR EN ISO 7027
5	pH	6,07	6,70	6,50	6,5-9,5	SR ISO 10523
6	NH_4^+ (mg/l)	0,054	0,194	0,060	≤ 0,5	SR ISO 7150/1/01
7	NO_3^- (mg/l)	20,1	22,5	22,2	≤ 50	SR ISO 7890-1
8	NO_2^- (mg/l)	0,011	0,013	0,018	≤ 0,5	SR 3048-2
9	Ca^{2+} (mg/l)	52,8	55,01	53,5	≤ 100	STAS 3662/90
10	Cl^- (mg/l)	8,26	10,32	10,65	≤ 250	SR ISO 9297/01
11	Total durity	9,63	9,45	9,46	≥ 5	STAS 3026/76
12	Iron (mg/l)	0,09	0,175	0,128	≤ 0,2	SR ISO 6332/96
13	Mg^{2+} (mg/l)	9,72	7,55	8,35	≤.50	STAS 3662/90
14	Alcalinity	2,0	1,94	1,90		SREN ISO9963/1
15	HCO_3^- (mg/l)	112	118,3	116,2		SREN ISO9963/1
16	CCO-Mn (mg/l)	1,56	0,91	0,73	≤5	SR EN ISO 8467
17	Conductivity (µS/cm)	395	396	398	≤2500	SR EN 2788

Table 4

Variation of physic and chemic parameters in spring water from Nufarul in April 2009

	Article III. Parameters	1-10 April 2009 After raining	11-20 April 2009	21-30 April 2009 After raining	Normal values – Law 458/2002	Analysis method
1	Taste	Normal	Normal	Normal	Normal	SR EN 1622/2000
2	Smell	Normal	Normal	Normal	Normal	SR EN 1622/2000
3	Colour	Normal	Normal	Normal	Normal	ISO 7887/97
4	Turbiditity	4,68	2,55	4,3	≤ 5	SR EN ISO 7027
5	pH	6,70	6,75	6,48	6,5-9,5	SR ISO 10523
6	NH_4^+ (mg/l)	0,194	0,40	0,82	≤ 0,5	SR ISO 7150/1/01
7	NO_3^- (mg/l)	22,5	22,5	22,1	≤ 50	SR ISO 7890-1
8	NO_2^- (mg/l)	0,013	0,015	0,022	≤ 0,5	SR 3048-2
9	Ca^{2+} (mg/l)	55,01	52,3	53,6	≤ 100	STAS 3662/90
10	Cl^- (mg/l)	10,32	11,2	10,8	≤ 250	SR ISO 9297/01
11	Total durity	9,45	9,6	11	≥ 5	STAS 3026/76
12	Iron (mg/l)	0,175	0,080	0,155	≤ 0,2	SR ISO 6332/96
13	Mg^{2+} (mg/l)	7,55	7,75	8,3	≤.50	STAS 3662/90
14	Alcalinity	1,94	1,88	1,92		SREN ISO9963/1
15	HCO_3^- (mg/l)	118,3	117,5	117,9		SREN ISO9963/1
16	CCO-Mn (mg/l)	0,91	0,67	0,88	≤5	SR EN ISO 8467
17	Conductivity (µS/cm)	396	398	397	≤2500	SR EN 2788

Table 5

Variation of physic and chemic parameters in spring water from Nufarul area in May 2009

	Article IV. Parameters	1-10 May 2009 After raining	11-20 May 2009	21-31 May 2009	Normal values – Law 458/2002	Analysis method
1	Taste	Normal	Normal	Normal	Normal	SR EN 1622/2000
2	Smell	Normal	Normal	Normal	Normal	SR EN 1622/2000
3	Colour	Normal	Normal	Normal	Normal	ISO 7887/97
4	Turbiditity	4,5	2,8	0,90	≤ 5	SR EN ISO 7027
5	pH	6,40	6,62	6,58	6,5-9,5	SR ISO 10523
6	NH_4^+ (mg/l)	0,65	0,065	0,037	≤ 0,5	SR ISO 7150/1/01
7	NO_3^- (mg/l)	21,8	22,4	22,5	≤ 50	SR ISO 7890-1
8	NO_2^- (mg/l)	0,080	0,045	0,020	≤ 0,5	SR 3048-2
9	Ca^{2+} (mg/l)	52,6	52,0	51,79	≤ 100	STAS 3662/90
10	Cl^- (mg/l)	10,8	11,05	11,22	≤ 250	SR ISO 9297/01
11	Total durity	11,5	9,62	9,51	≥ 5	STAS 3026/76
12	Iron (mg/l)	0,185	0,068	0,027	≤ 0,2	SR ISO 6332/96
13	Mg^{2+} (mg/l)	8,26	9,05	8,83	≤.50	STAS 3662/90
14	Alcalinity	1,93	1,90	1,88		SREN ISO9963/1
15	HCO_3^- (mg/l)	118,5	115,2	114,6		SREN ISO9963/1
16	CCO-Mn (mg/l)	0,91	0,73	0,67	≤5	SR EN ISO 8467
17	Conductivity (μS/cm)	396	400	400	≤2500	SR EN 2788

Table 6

Variation of physic and chemic parameters in spring water from Nufarul area in June 2009

	Article V. Parameters	1-10 June 2009	11-20 june 2009	21-30 june 2009	Normal values – Law 458/2002	Analysis method
1	Taste	Normal	Normal	Normal	Normal	SR EN 1622/2000
2	Smell	Normal	Normal	Normal	Normal	SR EN 1622/2000
3	Colour	Normal	Normal	Normal	Normal	ISO 7887/97
4	Turbiditity	0,60	0,51	0,44	≤ 5	SR EN ISO 7027
5	pH	6,60	6,60	6,61	6,5-9,5	SR ISO 10523
6	NH_4^+ (mg/l)	0,037	0,036	0,036	≤ 0,5	SR ISO 7150/1/01
7	NO_3^- (mg/l)	21,8	18,2	16,21	≤ 50	SR ISO 7890-1
8	NO_2^- (mg/l)	0,021	0,023	0,024	≤ 0,5	SR 3048-2
9	Ca^{2+} (mg/l)	52,05	53,25	53,76	≤ 100	STAS 3662/90
10	Cl^- (mg/l)	13,42	15,96	16,57	≤ 250	SR ISO 9297/01
11	Total durity	13,90	17,86	21,61	≥ 5	STAS 3026/76
12	Iron (mg/l)	0,020	0,013	0,008	≤ 0,2	SR ISO 6332/96
13	Mg^{2+} (mg/l)	7,74	6,30	6,13	≤.50	STAS 3662/90
14	Alcalinity	1,875	1,87	1,87		SREN ISO9963/1
15	HCO_3^- (mg/l)	114,3	114,1	114		SREN ISO9963/1
16	CCO-Mn (mg/l)	0,66	0,65	0,65	≤5	SR EN ISO 8467
17	Conductivity (μS/cm)	401	401	402	≤2500	SR EN 2788

All of the results obtained in the following of the spring water determinations, they were recorded in the next graphics. The evolution of these parameters represents the interest point of our study.

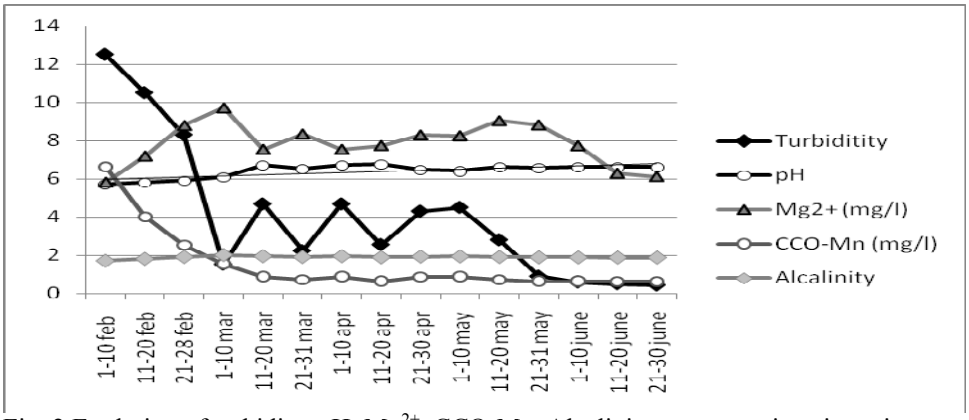

Fig. 2 Evolution of turbidity, pH, Mg^{2+}, CCO-Mn, Alcalinity concentrations in spring water from Nufarul between February and June 2009

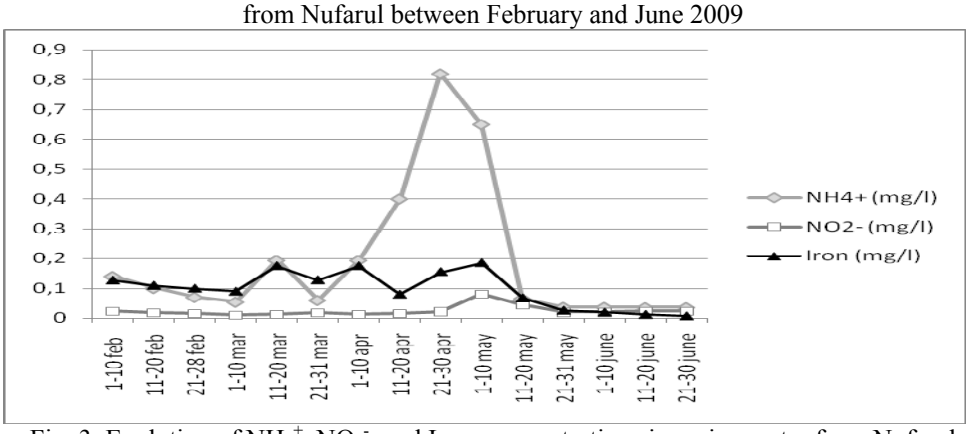

Fig. 3. Evolution of NH_4^+, NO_2^-, and Iron concentrations in spring water from Nufarul between February and June 2009

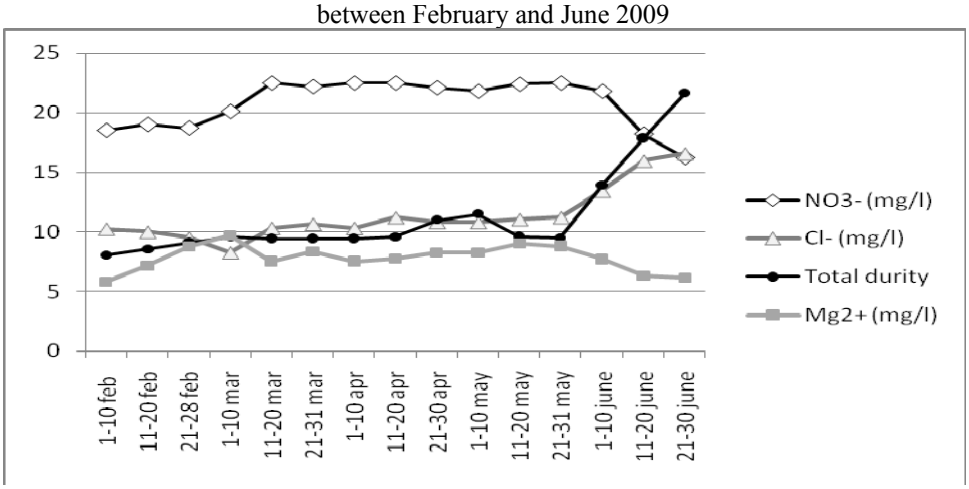

Fig. 4. Evolution of NO_3^-, Cl^-, Mg^{2+} and total durity concentrations in spring water from Nufarul between February and June 2009

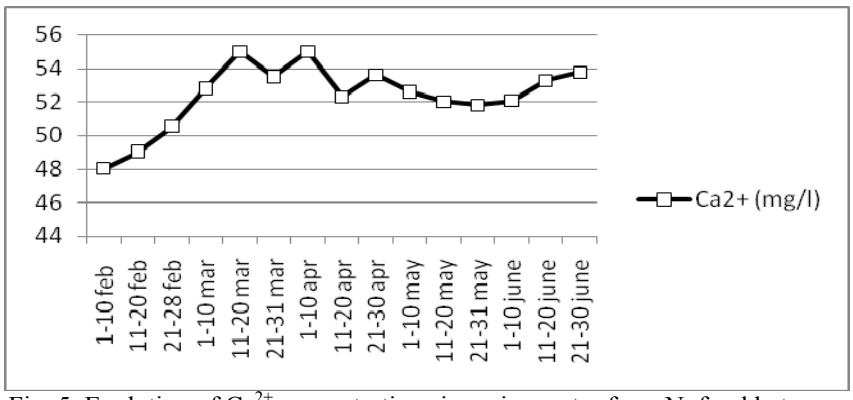

Fig. 5. Evolution of Ca^{2+} concentrations in spring water from Nufarul between February and June 2009

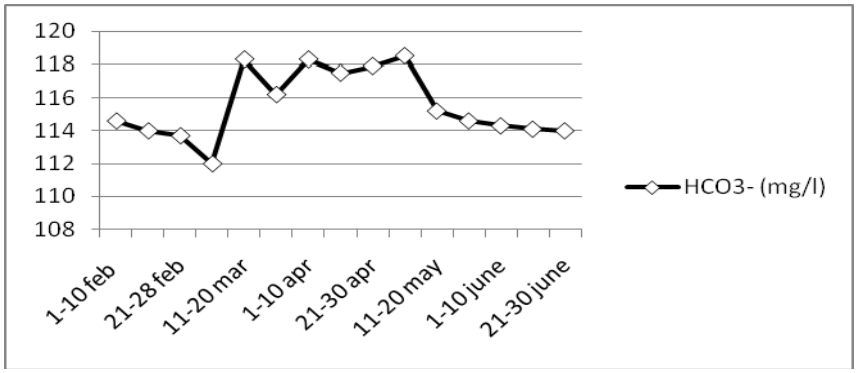

Fig. 6. Evolution of HCO_3^- concentrations in spring water from Nufarul between February and June 2009

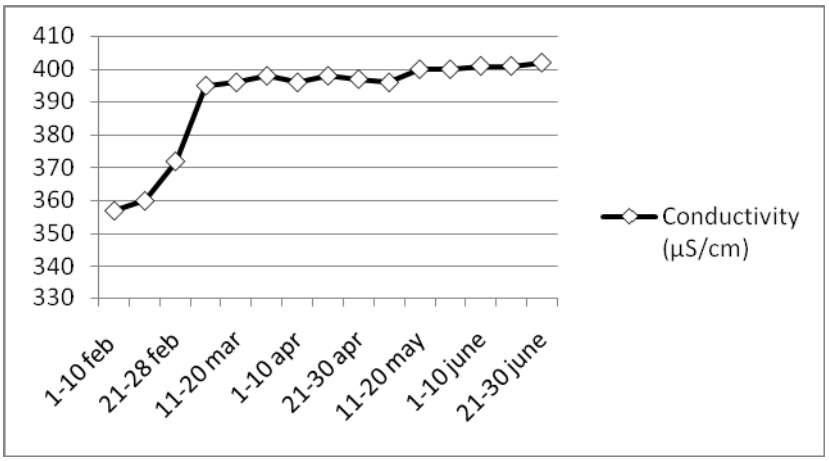

Fig. 7. Evolution of conductivity in spring water from Nufarul between February and June 2009

CONCLUSIONS

The monitoring of the spring water in Nufarul district from Oradea drives us to the next conclusions:

1. The water has a big mycrobiological charge and this grows after raining or snowing.
2. The turbidity is greater than normative value, especially after raining and snowing, but it decreases from February to June.
3. The pH hasn't a significant evolution along the month, but it becomes easy low after raining and snowing.
4. The oxidable substances (CCO-Mn) concentration has a maximum value in February, greater normal value, but it decreases constant in every month.
5. The ammonium concentration touches maximum values after raining, and this can be superior admitted values in some situations.
6. Fortunately, NO_2^- and NO_3^- rests in normal values.
7. The alkalinity remains slowly constant, but the total durity grows from February to June.

In conclusion this spring water has a lot chemic and physic parameters in normal values, with some exceptions at turbidity, pH and oxidable substances after raining and snowing, but the mycrobiologic analysis shows constant a contaminate water.

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