RESEARCHES REGARDING QUALITY OF PHREATIC WATER FROM WEST OF ROMANIA

Ersilia ALEXA[1], Aurel LĂZUREANU[1], Liana CUC[1], Carmen GAL[2], Anca DRĂGUNESCU[1], Irina MATEI[1]

[1]U.S.A.M.V.B. Timişoara
[2]AQUATIM Timisoara

ABSTRACT

Agriculture has a great importance in the west of Romania. In order to obtain a lucrative production, it is necessary to use the fertilizer and the use of pesticides, which assure the best results regarding the quality level of agricultural production and lucrative results, but also being the cause of contamination and danger over the people and natural environment.

The scope of this paper is the monitoring of nitrates, nitrites, and ammonium content as well as the pesticides content in surface and underground phreatic water from private fountains in the Timis and Arad districts.

Keywords:

nitrate, nitrite, ammonium, organochlorinated pesticides, water

INTRODUCTION

Because of using the fertilizers and the pesticides in the agriculture, it has been found that the natural underground water resources are seriously polluted with chemical substances, which include nitrates, nitrites, ammonium, or pesticides. The infiltration of the residues in the agricultural terrain represents a source of contamination especially in the areas where the agriculture is intensively practiced. A large amount of nitrate is formed during the microbiological processes, which take place in the organic compounds with nitrogen and ammonium; these are coming from household fertilizer (household refuse), commercial fertilizer, purifying mud (filtration), residues from harvesting, residues from radiculaceae (root crops) and humus components.

The loss of nitrogen from washed soil with water coming from rainfalls or irrigation, is due in special by the levigation of nitrates. The levigation of nitrates represents a source of pollution, as the effect of

accumulation of the nitrates in phreatic water, which could represent a possible source of drinking water [6].

Nitrites appear in the second stage of the mineralizing process of organic substances. That is why the presence of nitrites in the water is the sign of an old polluting process. Because the nitrites are toxic, the water standards do not allow the presence of nitrites in water.

The presence of higher concentration of nitrates, nitrites, and ammonium in water is driving the situation on negative influence over the human body. Nitrates are causing irritant effects, congestive effects over the gastric mucous as well as nephro-toxicity. Reducing the nitrates by the microbial flora, the nitrites appear at the level of digestive tube. These have the capacity of oxidizing hemoglobin. The effect is reducing the oxygen fixing capacity, the decreasing of tissual perspiration and the modifying of mucous color in brown-grey. These symptoms are typically for cyanosis disease [1].

Another risk factor over the human health, which derives from water pollution, is the contamination with pesticides of underground and surface water sources.

The intoxication with pesticides using contaminated water, could be discovered rarely in acute stages, because of the low solubility of pesticides in water, but mostly by modifying the water characteristics (smell, taste, color) which coul rapidly alert people.

In water, the pesticides suffer a biodegradation process, rapidly or slowly, depending on their composition. The organochlorurated pesticides (HCH, DDT, Aldrine, Dieldrine) are slowly degraded having a higher remanence, fact that driving the situation for withdrawal the product from manufacturing [3].

The contamination of underground and surface water with nitrates, nitrites, ammonium, and pesticides, in Banat's area represents a problem of present interest.

Since 1994, the Banat's University of Agricultural Science and Veterinary Medicine together with the Federal Department for Plants Protection in Stuttgart, had been analysed the contamination with nitrites and pesticides of phreatic and drinking water, from the west part of Romania [2,4, 5].

This paper is a continuation of the studies, made in the program of romanian-german research. The scope is the monitoring of nitrates, nitrites, and ammonium content as well as the pesticides content in surface and underground phreatic water from private and public fountains in Timis and Arad districts.

MATERIALS AND METHODS

The nitrate, nitrite and ammonium content had been examinated by spectrophotometric method using Merck Test. The pesticides content (DDT, DDD, DDE, Aldrine, Dieldrine, Endrine, Heptachlor, Heptachlor epoxide) had been examinated by gas-chromatographic method.

Chromatographic conditions: ECD detector, SE-30 column, Tdetector 250^0C, T column 200^0C, mobile phase N_2, 40 ml/min.

The drawing points of samples from Timis district: Giarmata Vii, Becicherec, Birda, and Gataia. The drawing points of samples from Arad district: Beliu, Tagadau, Berindia, Barsa, Aldesti.

The samples was preleveted in january, april and iulie 2002. The description of natural environment of the researched areas is presented in tabel 1. The maximal admitted limits and the minimal detection limits for nitrate, nitrite and ammonium are presented in table 2.

RESULTS AND DISCUSSIONS

The results are shown in table 3.

The experimentally results indicate that in the case of surface phreatic water from Gataia place, there a higher pollution with nitrates (10 times higher than the maximum admissible limit). The source of this contamination was the storehouse of the fertilizers, which during the period of 1960 – 1989 used in an inappropriate way, being left uncovered at a distance of 60 m from a fountain nearby Gataia railway station. The nitrogen had been infiltrated in phreatic water, causing the contamination. A highest level of ammonium in phreatic water (hundreds of mg/l) indicates a sever contamination of the water in that area.

In the case of surface phreatic water from Birda and Becicherec place, there a higher pollution with nitrates but lowers comparing with the case of phreatic water from Gataia. The experimentally results indicate a higher content of nitrates in the surface phreatic water from Giarmata Vii (fountain with depth of 5 m).

In Arad district the contain of the nitrate, ammonium and nitrite in the phreatic water, it doesn't outrun the maximum admitted level.

After an analysis of contamination causes with nitrate of surface phreatic water, in Banat's area, it was found out that the cause is the existence of porcine farms from COMTIM center. So, in Banat's area, the integration of porcine' residues for using them as manure, is still zero. Financial sources are missing for Banat's animal farms, for a modern proceeding of porcine residues, as in the Western Europe countries, in the scope of minimizing the contamination of natural environment and decreasing of commercializing of the manure. In the same time the unlimited discharge of these residues around the porcine farms generate a higher content of nitrates in the surface phreatic water, which represents the most important source of drinking water for Banat's village area.

In the place of Giarmata Vii, there is an increasing of nitrates in phreatic water because of the intensive agriculture. Another cause of higher content of nitrates in surface phreatic water on Giarmata Vii area, is the position of the territory nearby the International Airport of Timisoara. For defrosting of the flight strip in wintertime, it was used for 20 years fertilizers based on nitrogen. Because of using this method, the nitrogen was infiltrated in the phreatic water, having an important influence over the nitrate content.

The experimentally results obtained on the fountain from Giarmata Vii, having a depth of 75 m and public fountain from Gataia, show that there is an important potential of phreatic water in Romania, which could be use in the future.

Content of nitrites and ammonium from analyzed water does not indicate a contamination of that source of water, excepting fountain of Gataia. The presence of nitrites and ammonium in the water is the sign of an old polluting process.

The increasing of the nitrate level in the surface phreatic water draw from Becicherec area is represented by the farms with a numerous effective of animals. In farms don't have a station for water epuration, deject are collected in Surduc channel. This channel collects also the worn out water from the village cross the neighborhood of the analyzed fountain. Regarding the contain of the ammonium and nitrite in the freatic water from Becicherecul Mic, it doesn't outrun the maximum admitted level.

A very important fact is that the results of the analyzed samples of water, in over 60 m depth fountains, semnalates a high quality of the potable water from freatic water situated in depth. This shows that in Banat`s zone the filtration capacity of the covered stratification situated over the depth freatic water, is intact. The specific tips of soil in Banat`s are mud's, which filtrate the inferiors substances and in the same time favor the bearing capacity of soils. The nitrate contains of the freatic water situated in depth are about 0.1 mg/nitrate/liter.

In the same fountains situated in Becicherecul Mic, Gataia and Birda, had been examinated the contamination of phreatic water with pesticides. The results of the studies showed that not exist a contamination of the surface phreatic water because of the low mobility of these pesticides in soil.

Tabel 1. The description of natural environment of the researched areas

Rural space	Natural environment
Timiş district	
Birda Adâncime fântână 5 m	Private fountain nearby of porcine farms from COMTIM
Gătaia Adâncime fântână 5 m	Private fountain at a distance of 60 m from Gataia railway station, which during the period of 1960 – 1989 used in an appropriate way storehouse of the fertilizers
Becicherecul Mic Adâncime fântână 6 m	Private fountain nearby farms with a numerous effective of animals
Giarmata Vii Adâncime fântână 6 m	Private fountain nearby the International Airport of Timisoara
Giarmata Vii Adâncime fântână 100 m	Private fountain nearby the International Airport of Timisoara
Arad district	
Berindia	Private fountain nearby intensive agriculture
Craiva	Private fountain nearby farms with animals
Tăgădău	Private fountain nearby intensive agriculture
Bârsa	Private fountain nearby intensive agriculture
Beliu	Private fountain nearby intensive agriculture

Table 2. The maximum admited levels (LMA) and the minimal detection limits (LMD) for nitrate, nitrite and ammonium

	NO_3 (mg/L)	NO_2 (mg/L)	NH_4 (mg/L)
LMA (mg/L)	45	0	0
LMD (mg/L)	0.1	0,02	0,01

Tabel 3. The water contamination with nitrate, nitrite and ammonium of the researched areas (medium values)

Rural space	NO_3 (mg/L)	NO_2 (mg/L)	NH_4 (mg/L)
Becicherec	225	<0,02	<0,01
Gătaia	3300	20	321
Gătaia (public fountain)	<0.1	<0,02	<0,01
Birda	410	<0,02	<0,01
Giarmata Vii (5m)	<0.1	<0,02	<0,01
Giarmata Vii (75 m)	210	<0,02	<0,01
Berindia	54.6	0.136	<0,01
Craiva	22.1	0.012	<0,01
Tagadau	19	0.5	<0,01
Barsa	44	<0,02	<0,01
Beliu	2.6	<0,02	<0,01

CONCLUSIONS AND RECOMMENDATIONS

1. Contain of nitrate in freatic surface water in rural zone is very high and made by the pigs combine works, in which is missing the dejection's removal system, in one side and at the other side by the unpropal administration of chemical fertilizers and by the practice of intensive agriculture.
2. By the analyzes of pesticides contain in water result that in west of Romania, the contain of the organochlorinated pesticides it doesn't outrun the maximum admitted level (0.1 μg pesticides/liter water), indicated by CE.
3. Researches of depth phreatic water show a high quality of it, Romania has in great resources.

There is a need of supervision and control programs, which include these aspects:

- growth of the number of quality measuring places for surface and depth phreatic water;
- practice of an agriculture with a proper rotation of cultures and an optimal choosing of the soil working type (immediately after culture, the soil must be ploughed then sowed, so the ground to be covered and the plant to restrain the nitrogen);
- sowing without lacks of the ground and introduction of alternative cultures between harvests represent a way of prevention the lost of these substances in freatic water. The roots and parts of plants, which give humus, improve the capacity of maintenance and change of ground, a protector strait, decrease the foundation of mud, improve the passing of air and water as regarding the biological activity, every strait of plants gives upkeep for living

being, speed up degradation of organic substances (pesticides), regulate nitrogen exchanges;

- Administration of fertilizers which may avoid draining of nitrogen. Administration may be executed when plant needs it;
- A proper working of the ground. On sandy land, rich in humus, a deep plunging made in autumn may speed up the nitrate mineralization, will be levigated. There, where is possible, it must be effectuated a plan working. That is possible in spring, not autumn. Organic soils must be cultivated with vegetable. These lands are situated a little in top of surface freatic water level. In these parts there exist big amounts of nitrate in freatic and drinking water;
- As regard the animal rise system, the maintenance of a proper conditions supposes introduction of a remove system for dejection on a hydraulic way. The mixture of fecal, pass water is diluted by the washing water who became used water and is collected.

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