THE MUNICIPAL LAKES AND CLEANING SYSTEM TO PROTECT ENVIRONMENT AND HUMAN LIFE

DOGAN OZDEMIR

Abstract—The paper is about the actual ecologic situation of municipal lakes in the city Chisinau (Lake form: park "Valea Trandafirilor", park "Riscani", Lake "La Izvor" and Lake "Gidighici" was determined the eutrophication level of these lakes and were offered several methods of solving the problem of the municipal Lakes.
On the bases of the obtained results it can be affirmed that Chisinau's lakes represents aquatic basins with high eutrophication level. Probably the Ghidighici Lake has higher self-evaporation capacity and it's water is cleaner than others urban studied lakes. The reducing of phosphor and nitrogen contribution from waste waters is the base factor to combat eutrophication of Chisinau lakes.

Keywords— Lake, aquatic basins and evaporation

I. INTRODUCTION

Moldova has an approximate number of 3000 reservoirs of water.
Although not all of them can be used as drinkable water, they play a major role for the environment and the economy of the Republic. The greatest danger to artificial (non-natural) lakes is eutrophication. Eutrophication is a phenomena which appears in summer, when at high temperatures the quantity of nutrients increase and they become more concentrated. Acquiring of organic mass from agricultural filed drains and the increasing of nutrients (Nitrogen and Phosphorus) leads to ample development of microorganisms which consume in great proportions Oxygen from the water. The lack of Oxygen causes death of fish and disappearance of other Hydrobionts. Eutrophication appears especially in Oxygenated waters (Duca & Mihaila, 1995).
The aquatic resources of Chisinau is limited. The surface waters are the river Bâc and its affluents (streams) which flow through the urban area, dam lakes Gidighici and Ialoveni which are situated in a suburban zone and 18 smaller lakes.

The goal in this research was: analyzing the actual state of some lakes from city Chisinau and advising solutions to improve them. For accomplishing the goal
We based on this objectives (directives):evaluation of the ecological state in which the local lakes are; determination of the eutrophic level of the lakes and suggesting new modalities for bettering of the ecological state of the lakes in Chisinau.

II. MATERIALS AND METHODS

A. Objects of Examination

Aiming our main goal of studying the eutrophic level of Chisinau lakes, where selected 4 base lakes: Inferior lake in park "Valea Trandafirilor", the inferior lake form park "Riscani",the main lake from park "La Izvor", and accumulation lake "Gidighici" which all served as objects of examination.

B. Method of Examination

Collecting samples: Samples were drawn from the lakes during 2 seasons-winter and summer. At each lake where selected 3 permanent places for collecting the samples-2 at the sides of the lakes and one in the middle. The samples were taken under 15-20 cm from the surface of the lake. All the samples where collected in glass tubes and the temperature was fixed, after which we took them immediately to the laboratory (maximum 24 hours).

Determination of water quality:

There were determined chemical indicators for the eutrophication process of Natural lakes and water accumulation basins according to Sanitary Rules. Protection of water basins (tab. 1)

Nr.	Trophic stage	P total mg P/l	N total mg N/l	Minimum saturation with oxygen %
1	Ultraoligotroph	till 0,005	0,200	Over 70
2	Oligotroph	0,005-0,01	0,200-0,400	Over 70
3	Mezotroph	0,01-0,03	0,400-0,650	10-70
4	Eutroph	0,03-0,1	0,650-1,500	Below 10
5	Hipertroph	Over 0,1	1,500	Below 10

The water quality categories where determined as it says in the Sanitary Rules of the Water protection against Pollution (Sireţeanu, 1997).
Determination of P total was accomplished by the method of determination of phosphate-ions, the using the indicator of passing from Mg2P2O7 to P which is 0, 2784 (Cojocaru & Surse, 1995).
Determination of oxygen quantity in the water was made using the WINKLER method:
It is necessary to remark that for determining the concentration of Oxygen in the natural water , parallel was written down the temperature of water at the moment when the samples where taken. The

results where compared with the data from the table of Oxygen solubility in water with different temperatures at atmospheric pressure of 760mm, calculating the grade of saturation of water with O2. (Gheorghe &Victor, 2006)

C. Determination of Nitrogen

It was used the photochlorimetric method to identify the nitrogen. Organic compounds are decomposed with H2SO4 in the presence of a Catalyst- copper sulfate and Potassium sulfate- eliminating ammonia from the basic solution. Ammonia Ions in interaction with Nessler's reagent forms complex compounds (mercury ammonia iodate) colorants in yellow-brown. The optic density is measured at the spectrophotometer (Mălacea, 1989).

RESULTS AND DISCUSSION

One of the most important factors that determine the biological productivity of the lakes is the amount of Nitrogen and Phosphorus in them. The annual variety of concentration of N and P minerals in the aquatic basins of the City Chisinau is caused by the streams , atmospheric precipitations , the dynamics of water and the processes of production and mineralization of the organic substances, the aquatic sediments which all are the chain loops of the substance circuit in lakes. In the 2006-2007 monitoring of the water quality included 4 artificial lakes. The characterization of water quality was made by interpreting the results of analysis of the samples referring to framing in the categories of quality.

We studied the minimum saturation of Oxygen, calculating the quantity of Oxygen dissolved in water. The percent of oxygen concentration in water is a little less than in atmosphere. It varies depending on the depth, streams etc. Oxygen is used by the hydrobiont aerobes to respire, and for the processes of oxidation which are developed in the ecosystems (Bârnea et al.,1983).

Index	date	Lakes from which we took samples			
		Râşcani	La izvor	Valea Trandafirilor	Ghidighici
P total mg P/l	14.01.06	0,024±0,002	0,029±0,001	0,020±0,002	0,009±0,001
	10.08.06	0,071±0,007	0,092±0,019	0,042±0,011	0,022±0,008
	23.01.07	0,028±0,001	0,030±0,001	0,013±0,001	0,010±0,002
	12.08.07	0,083±0,005	0,096±0,007	0,054±0,010	0,029±0,009
N total mg N/l	14.01.06	0,58±0,05	0,60±0,03	0,49±0,03	0,45±0,02
	10.08.06	1,33±0,03	1,55±0,01	0,75±0,04	0,67±0,03
	23.01.07	0,62±0,02	0,64±0,01	0,51±0,05	0,40±0,04
	12.08.07	1,30±0,04	1,43±0,02	0,89±0,01	0,72±0,02
Min. saturation with oxygen%	14.01.06	17,2±0,06	14,7±0,07	69,5±0,15	96,4±0,12
	10.08.06	9,4±0,03	2,9±0,04	8,4±0,23	11,1±0,01
	23.01.07	19,2±0,09	12,3±0,05	68,3±0,11	84,2±0,17
	12.08.07	8,1±0,01	3,2±0,03	7,9±0,09	6,4±0,02

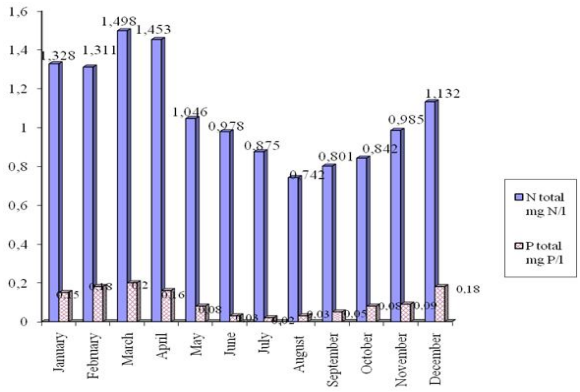

Fig. 1. Variation of N total and P total in water of the lake Râşcani

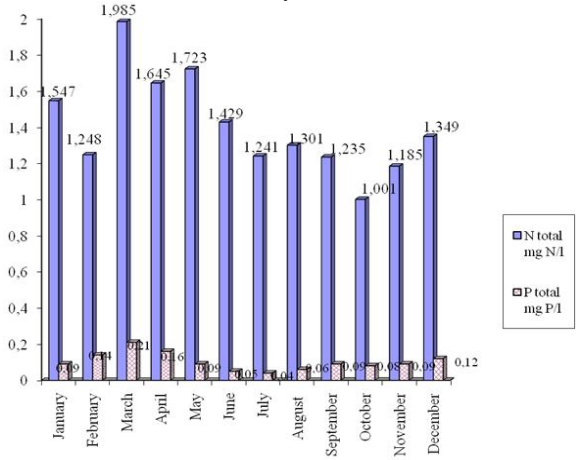

Fig. 2. Variation of N total and P total in water of the lake La izvor

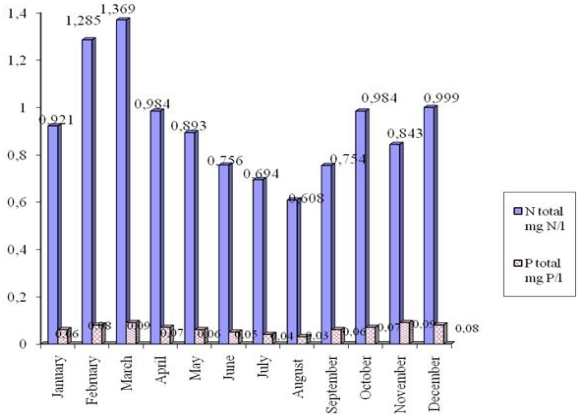

Fig. 3. Variation of N total and P total in water of the lake Valea Trandafirilor

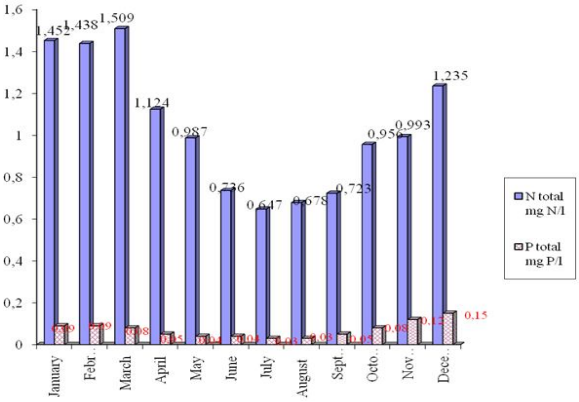

Fig. 4. Variation of N total and P total in water of the lake Ghidighici

Situation of the lakes (Fig. 1-4) reveals the following global aspects:

1. Out of 4 lakes, only Lake Ghidighici in summer time passes to Mezotrophic level

due to mussels which are present in the lake.

2. Lakes Parcul Valea Trandafirilor, Râşcani and La izvor are eutroph in all seasons (frequently a phenomena called „blooming of water ”occurs) .

Therefore after all the results were analyzed we can say that these Chisinau water basins are at a high level of eutrophication .Ghidighici only has an allowed level of it,as we supposed due to its bigger size, good autoepuration and mussels .

Therefore based on the obtained results The annual variety of concentration of N and P minerals in the aquatic basins of the City Chisinau is caused by the streams , atmospheric precipitations , the dynamics of water and the processes of production and mineralization of the organic substances, the aquatic sediments which all are the chain loops of the substance circuit in lakes.

The lowest quantity of Nitrogen was found in water of the lake

Valea Trandafirilor -(0,608 mg/l) in August (Fig. 3), and the highest in the lake

La Izvor –(1,985 mg/l) in March (Fig. 2.), placing the last in the Hypertrophic state (Tab. 2).

To verify the present affirmations ,was determined the concentration of 2 more elements , ions of iron and manganese which are influencing the water quality when the lake is at eutrophic state (Tab. 3).

TABLE III
CONCENTRATION OF IRON AND MANGANESE IN SOME LAKES OF MUN. CHIŞINĂU

Index	CMA	Data	Râşcani	La izvor	Valea Tranda-firilor	Ghidi-ghici
Iron	1,0 mg/l	14.01.06	1,7±0,04	1,9±0,02	1,1±0,02	0,7±0,01
		10.08.06	2,2±0,08	2,4±0,03	1,5±0,04	1,2±0,02
		23.01.07	1,8±0,01	2,0±0,05	1,4±0,01	1,1±0,05
		12.08.07	2,5±0,02	2,8±0,08	1,9±0,06	1,4±0,03
Manganese	0,1 mg/l	14.01.06	0,14±0,01	0,17±0,03	0,09±0,01	0,06±0,01
		10.08.06	0,28±0,02	0,32±0,01	0,14±0,06	0,08±0,01
		23.01.07	0,16±0,02	0,19±0,07	0,13±0,02	0,07±0,01
		12.08.07	0,33±0,04	0,38±0,05	0,19±0,03	0,09±0,05

The lake which exceeded the norms of CMA in concentration of Iron was La Izvor with 180% (2,8±0,08 mg/l) in summer season .In the progress of our research only lake Ghidighici had a normal iron concentration in winter 2006,the same was with manganese but all seasons (Tab. 3).

In the manganese probe La Izvor also beats the record with and +280 % (0,38±0,05) (Tab. 3).We can conclude that from all the studied lakes La Izvor is the most polluted .

The appearance of algae’s or other superior plants, bad smell of water ,diminished transparency, deoxygenation of it, represented for us the obvious symptoms of eutrophication in summer. The development of this organisms could be observed easily (a continuous algae field on the surface) or a very bad smell eliminated by the toxins .

From the analysis of the present data, we ascertained:

1. All of the 4 lakes entered in the II category of water quality.

2. The cleanest lake in ecological view is Ghidighici

3. Lake Ghidighici in summer is mezotroph and in winter Oligotroph, the other lakes in summer are Eutrophic and in winter mezotrophic.

Therefore after all the results were analyzed we can say that these Chisinau water basins are at a high level of eutrophication .Ghidighici only has an allowed level of it, as we supposed due to its bigger size, good aoutoepuration and mussels .

The process of Eutrophication is a continuous process when there is no interference. Reducing the Nitrogen and Phosphorus in lakes is the key to fight against eutrophication. As the solution we proposed basically mussels, but it depends on the lace and the environment, mussels use in their nutrition microscopic algae which are a symptom of eutrophication. Therefore biological filtrators, mussels contribute to reducing the Nitrogen and Phosphorus which algae used in nutrition. This case was proved with a big aquarium with water taken from lake La Izvor, we tried to get a similar environment, presence of algae was also included and using 3 mussels we got some results proving our expectations. In a period of time mussels used in nutrition the present algae and the quality of water was improved.

To prevent eutrophication we propose:

1. Evaporation of water

2. Collecting the waste waters and the stream flows in drainages and and evaporation of them.

3. Placing the artificial basins in a place where there are less farms or fields where can be used chemicals in plant growth, which are based on Nitrogen and Phosphorus.

In case when the eutrophic process already begun:

1. Adding clean water to make dilution

2. Oxygenating water

3. Introducing herbivore fishes and mussels

REFERENCES

[1] Duca, G., Mihaila, G., (1995). Chemistry Journal of Moldova, Chisinau. The chemistry of natural waters, Volume: 3, No:1, p: 288 .

[2] Lozan R., Ropot V., Sandu M.,(1992). Academy of Sciences of Moldova . Methods and guidelines for water quality control in Chisinau.

[3] Sireţeanu, D., (1997).The Hygienic Regulation (HR) “Protection of Water Bodies, against Pollution” issued by the Ministry of Health of the Republic of Moldova for water

bodies used for drinking water supply and recreation. No. 06.6.3.23. of 3,Chisinau.

[4] Cojocaru, I., Surse, I., (1995). Education Junimea. Procese products pollution, p: 58. Iaşi,Moldova.

[5] Gheorghe, G., Victor, Ş., (2006). Academy of Sciences of Moldova, Chemical analysis of water quality. p: 113 . Chisinau, Moldova.

[6] Mălacea I., (1989). Special Education. Biology contaminated water, p : 226. Bucuresti, Romania.

[7] Bârnea, M., M.,Chiosilă, I., Gavrilă, L.,(1983). Romanian Academy Publishing House, Biological effects of environmental pollution, p: 271. Bucuresti, Romania.

★★★