PHYTOPLANKTON DYNAMICS IN A FRESH WATER AQUATIC BASIN

Valerica Gîlcă[1*], I. Gîlcă[1]

[1]*University of Agricultural Sciences and Veterinary Medicine Iasi, Romania*

Abstract

In order to determine the composition of phytoplankton in fish tank in the village Ezăreni were first established sampling stations. For this purpose, samples were collected in three ways: in the upstream and downstream and in the central area. Were established the sampling periods depending on algae biomass dynamics. For detailed qualitative and quantitative study of phytoplankton samples were collected monthly (three months). To determine plankton were collected, each time, samples per liter of water. The materials that were used to determine the quality of phytoplankton were plantonic net, batometric glass, bottle with glass stopper or PVC bottles, fixing solution (formalin, IIK), microscope, glass slides, dyes, determination. Sampling was done differently depending on where and how the sample collection. Thus, samples were taken directly into the sample bottle, from water surface or from batometric glass when water was collected at various depths. Fixation tests aimed at preserving planktonic organisms able morphological state at the time of collection. Fixation was done with 4% formalin solution at a rate of 25ml to 1 liter of water or withn solution of iodine in potassium iodide in the range of 5 ml per 1 liter of water. Samples were analyzed under a microscope and noted species were found. Finally was pepared a list of species of algae exist in the ecosystem, called abstract floral list. The research results showed that in May there was the largest number of idividuals of phytoplankton (5557), and the lowest number of individuals was determined in April (5580). On taxonomic group found that in April the bacilarioficee were most abundant, followed by cloroficee, and cianoficee were the least abundant. In May all bacilarioficee were most numerous, followed by cloroficee and cianoficee. In June, clorofite were very abundant, cianofite abundant and less abundant were bacilarioficee.

Key words: pool, phytoplankton, dynamics, water

INTRODUCTION

Planktonic algae form communities of organisms plant with a foundamental role in the structure and physiology of aquatic ecosystems. These have a role in transforming the minerals in organic substances by the process of photosynthesis, are an important food source for consumers in the ecosystem, have a role in water balance in the oxygen gas produced by photosynthesis and carbon dioxide released by respiration, influences the physical properties of water such as transparency and turbidity and chemical properties such as salt concentration, gas concentration, pH [4, 5].

The phytoplankton's composition from the water basin varies according to season and physico-chemical conditions of the water. For a better characterization of the flora's algae from the water basin investigated was required a judicious choice of sampling stations, timing of sampling and compliance sampling methodology [6, 7].

Timing of sampling did so surprised to time sequence of different systematic groups of algae. Thus, the maximum development of diatoms was in spring and autumn, the cloroficee in summer and the cianoficee in late summer and early autumn. To establish the seasonal dynamics of algal biomass, samples collected at least twice a season. For detailed qualitative and quantitative study of phytoplankton had to collect monthly samples [1, 2, 3].

Sampling mode depended on the type of research that was done. To determine the

*Corresponding author:
m_valerica_univagro@yahoo.com
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taxonomic structure of phytoplankton, samples were collected with a net plankton, and for quantitative determinations were collected samples of unfiltered water (full water), taken directly from the pool or batometru. Qualitative analysis aimed knowledge the taxonomic structure of phytoplankton from the waterinvestigated and the phytoplankton's biomass [10, 11].

MATERIAL AND METHOD

In order to determine the composition of phytoplankton in aquatique basin in the village Ezăreni, were first established sampling stations. For this purpose samples were collected in three ways: in the upstream, central and downstream [1, 2].

Were established sampling periods in function of algal biomass dynamics. For detailed qualitative and quantitative study of phytoplankton samples were collected monthly (three months). To determine plankton samples were collected from each 1l of water each time [4, 5, 6].

The materials that were used to determine the quality of phytoplankton were plantonic net, batometric glass bottles, PVC bottles or glass stopper, fixing solution (formalin, IIK), microscope, slides, dyes, determination.

The collection of sampling was different depending on place of sample collection and how do it. Thus, samples were taken directly from bottle from thr water surface, or grom the batometric bottle when water was collected at various depths. Fixation tests aimed at preserving planktonic organisms able morphological located at sampling. Fixation was done with 4% formalin solution at a rate of 25ml to 1 liter of water, or solution of iodine in potassium iodide at a rate of 5 ml to 1 liter of water [4, 5].

Samples were analyzed under a microscope and noted species were found. Finally realised a list of species of algae exist in the ecosystem, called abstract floral list [10, 11].

Quantitative determination was to establish numerical density of algae in water volume, expressed in number of cells/liter or a phytoplankton biomass in mg/l or g/m^3.

Sampling was done directly in the glass collection on the surface of basin or in batometric glass batometrică when samples were collected from different depths [3, 5].

Samples was fixed with formalin concentrated to 25 ml in 1 liter of water, with iodine solution in potassium iodide at a rate of 1 ml per 100 ml of water. Iodine reagent in poatasiu iodide called reactive Ultermöhl is especially recommended if cianoficee are presece that due to gas vacuoles from cells floating at the surface of water. This solution makes all planktonic algae to settle on the bottom of ensuring good concentration of sample. The composition of this solution is as follows: iodine metallic - 5g, potassium iodide - 10g, glacial acetic acid, 10 ml, 100 ml distilled water. Concentration of the samples was done by centrifugation method, in special centrifuge with cups of 100 ml [4, 5, 6].

Sample preparation for analysis was done in several stages. First to complete a review sheet that includes the date and place of collection, water temperature, volume of bottle sample collection, the volume of water remaining after sedimentation and siphoning. Sample bottle with sediment remaining after siphoning was shaken vigorously to blend then took with pipette 5ml and was placed in a centrifuge tube. Centrifuge 15-25 minutes at a speed of 1000 revolutions per minute. With pipette was removed 4ml by superantant and then was stirred the remaining 1ml by bubbling [7, 8].

Microscopic analysis consist in examination of successive microscopic fields per preparation, identification of species and number of specimens of each species. On a microscopic slide to put a drop (0.03 ml) of the suspension stirred by bubbling. It was covered with a glass slide so as not to allow air bubbles between slides. He worked with a x20 objective, x10 ocular and lighting in the phase contrast. Species were identified and counted all algae organisms from 4-6 microscopic fields [2, 4, 5].

RESULTS AND DISCUSSIONS

As a result of research conducted in a basin of fresh water concerning on phytoplankton biomass, in the Research Station for Aquaculture and Aquatic Ecology Iaşi, were obtained a series of results presented in tables 1, 2, 3 and figures 1.2.

Table 1 Structure of phytoplankton on the species and groups of algae in April 2012

Taxonomic group / species	No. Indiv. / sample (liter of water)		
	01.04.2012	**15.04. 2012**	**30.04.2012**
Cyanophyta	**241**	**287**	**328**
Anabaena circinalis	48	54	62
Anabaena flos-aque	75	79	86
Mycrocistis aeruginosa	56	68	73
Oscillatoria fragilis	35	47	59
Oscillatoria sp.	27	39	48
Euglenophyta	**229**	**310**	**349**
Euglena acus	82	97	112
Euglena viridis	59	81	92
Phacus caudatum	88	132	145
Bacillariophyta	**655**	**821**	**1105**
Cymbela aspera	69	78	104
Cymbela cuspidate	92	115	139
Cymbela lanceolata	77	99	153
Dyatoma elongatum	85	119	164
Melosira varians	191	211	265
Navicula cryptocephala	85	123	187
Synedra acus	56	76	93
Chlorophyta	**324**	**411**	**520**
Chlorella vulgaris	39	45	57
Cosmarium sp.	96	112	154
Pediastrul duplex	32	65	81
Scenedesmus acutus	44	57	73
Scenedesmus fexuosus	75	89	96
Scenedesmus quadricauda	38	43	59
Total	**1449**	**1829**	**2302**

As shown in table 1and figure 1, in April 2012 were collected a number of 5580 phytoplankton's individuals. Regarding the structure of phytoplankton in April 2012, we find that the dominant were bacilariofite (2581 individuals), followed by chloroficee (1255 individuals), then euglenofite (888 individuals), while cianofite were the least numerous (856 individuals).

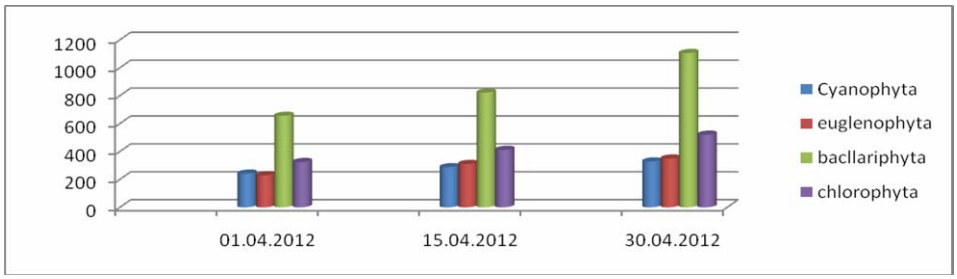

Figure 1 Structure of phytoplankton on the species and groups of algae in April 2012 (no. Indiv. /l)

Table 2 Structure of phytoplankton on the species and groups of algae in May 2012

Taxonomic group / species	No. Indiv. / sample (liter of water)		
	01.05.2012	15.05.2112	30.05.2012
Cyanophyta	**381**	**590**	**761**
Anabaena circinalis	81	123	167
Anabaena flos-aque	86	145	172
Mycrocistis aeruginosa	93	127	165
Oscillatoria fragilis	55	98	144
Oscillatoria sp.	66	97	113
Euglenophyta	**210**	**298**	**360**
Euglena acus	91	132	156
Euglena viridis	48	67	81
Phacus caudatum	71	99	123
Bacillariophyta	**410**	**684**	**973**
Cymbela aspera	61	98	156
Cymbela cuspidate	84	145	212
Cymbela lanceolata	51	87	143
Dyatoma elongatum	63	97	139
Melosira varians	43	69	89
Navicula cryptocephala	70	132	159
Synedra acus	38	56	75
Chlorophyta	**397**	**620**	**873**
Chlorella vulgaris	51	87	112
Chlorella sp.	47	65	130
Cosmarium sp.	72	114	167
Pediastrul duplex	42	67	96
Scenedesmus acutus	45	73	91
Scenedesmus fexuosus	87	145	189
Scenedesmus quadricauda	53	69	88
Total	**1398**	**2192**	**2967**

In May 2012 samples were collected in total of 6557 individuals, of which were dominant and this time bacilarioficee (2067de individuals), followed by chlorofite (1890 individuals), then cinofite that were present in numbers of 1732 individuals, the less numerous being euglenofite (868 individuals).

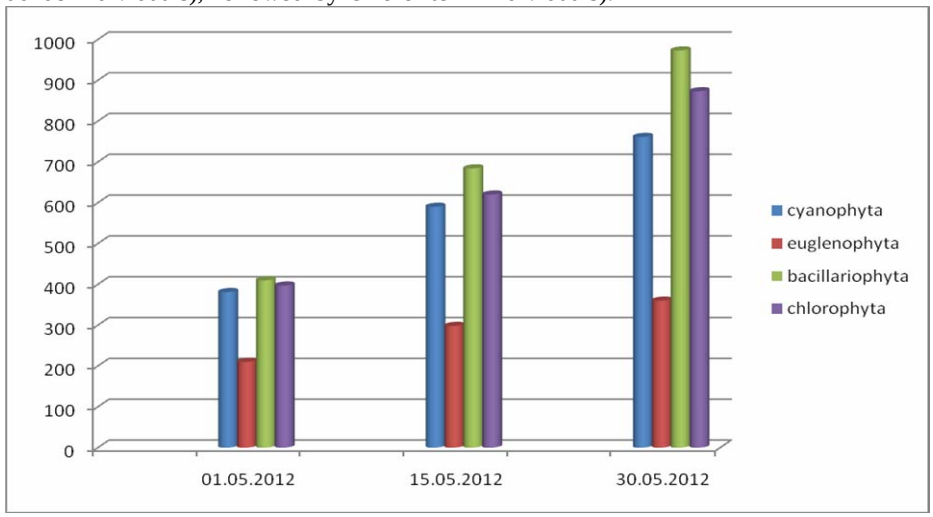

Figure 2 Structure of phytoplankton on the species and groups of algae in May 2012 (no. indiv. /l water)

Table 3 Structure of phytoplankton on the species and groups of algae in June 2012

Taxonomic group / species	No. Indiv. / sample (liter of water)		
	01.06.2012	15.06.2012	30.06.2012
Cyanophyta	**645**	**547**	**232**
Anabaena circinalis	33	31	27
Anabaena flos-aque	51	56	49
Mycrocistis aeruginosa	79	65	51
Oscillatoria fragilis	61	49	44
Oscillatoria sp.	89	67	61
Euglenophyta	**140**	**149**	**150**
Euglena acus	57	61	69
Phacus caudatum	83	88	81
Bacillariophyta	**448**	**475**	**447**
Cymbela aspera	59	66	79
Cymbela cuspidate	88	79	81
Cymbela lanceolata	56	61	59
Dyatoma elongatum	77	82	71
Melosira varians	45	67	53
Navicula cryptocephala	68	59	55
Synedra acus	55	61	49
Chlorophyta	**626**	**986**	**1289**
Chlorella vulgaris	91	163	215
Cosmarium sp.	118	167	236
Pediastrul duplex	139	212	287
Scenedesmus acutus	151	234	295
Scenedesmus fexuosus	78	143	167
Scenedesmus quadricauda	49	67	89
Total	**1859**	**2157**	**2118**

The data in table 3 and figure 3 shows that in June 2012 there were collected a total of 6134 phytoplankton's individuals, dominant at this time was clorofite with 6134 individuals, followed by cianofite with 1424 individuals, then bacilariofite with 1370 individuals and finally euglenofitele with 439 individuals.

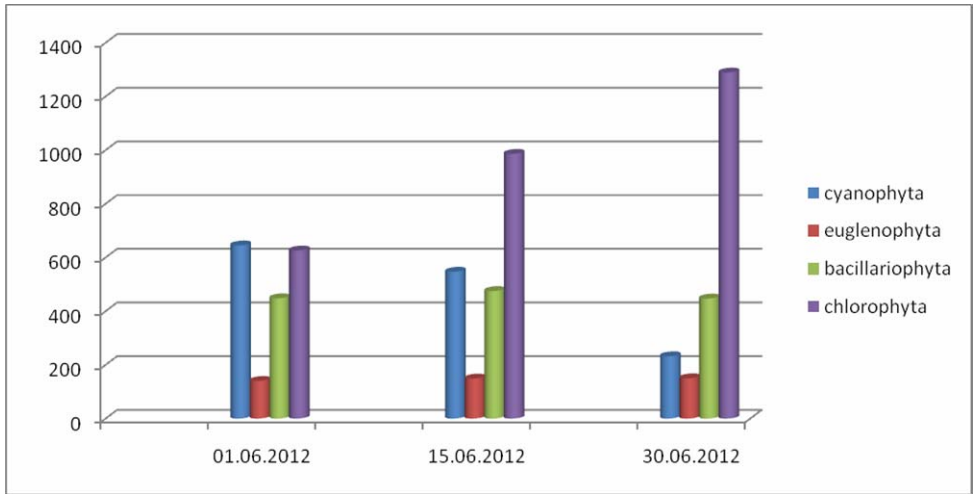

Figure 3 Structure of phytoplankton on the species and groups of algae in June 2012 (no. indiv. /l water)

CONCLUSIONS

In the summer of 2012 in the three months to carry out research on the structure of phytoplankton in a freshwater pool r was collected a total of 18,371 individuals belonging to four groups of phytoplankton systematic: Cyanophyta, euglenophyta, Bacillariophyta and clorophyta.

As the number of individuals phytoplankton collected, they were more numerous in May (6557 individuals), then in June (6134 individuals) and the fewest in April (5580 individuals).

Regarding the structure of the phytoplankton by taxonomic groups, were most abundant bacilariofite in April (2581 individuals) and in May (2060 individuals), followed by chlorofite in June (2901 individuals) and May (1890 individuals).

The cianofite were most abundant in May (1732 individuals) and June (1424 individuals), while the euglenofite were higher in April (888 individuals) and May (868 individuals).

We appreciate that investigated water basin is rich in phytoplankton, thus providing an important source of food for many species of hydrobionts and is also an important source of oxygen for all hydrobionts from this water basin.

REFERENCES

[1] Andrei M., 1997 - *Morfologia generala a plantelor, Ed.* Enciclopedica, Bucureşti;
[2] Beldie Al., 1977, 1979 - *Flora Romaniei, vol. I, II,* Ed. Acad. Rom., Bucureşti;
[3] Billard R., Marie D.; 1980, *La qualite des euax de l etang de pisciculture et son controle,* INRA, Paris;
[4] Battes K., Mazareanu C., Pricope F., Carau~ L, Marinescu Virginia, Rujinschi Rodica, *2003, Productia şi productivitatea ecosistemelor acvatice,* Editura "Ion Borcea", Bacau;
[5] Grozea A., 2003, *Acvacultura,* curs, Editura Excelsior Art, Timisoara;
[6] Mustata *Gh., 2000, Hidrobiologie,* Editura Universitatii "Alex. loan Cuza " Iasi
[7] Morariu L, 1973 - *Botanica generala ~i sistematica,* Ed. Ceres, Bucureşti;
[8] Morariu I., Todor L, 1966 - *Botanica sistematica,* Ed. Did. si Ped., Bucureşt I;
[9] Pasarin B., Stan Tr,, 19996, *Acvaculturd,* curs, U.S.A.M.V., Iaşi;
[10] Turenschi E., 1973 - *Botanica,* Ed. Did. şi Ped., Bucuresti;
[11] Roland J.-C., Roland F., 1987 - *Atlas de Biologie vegetale,* 4-e edition, Masson, Paris.