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Original Article

Diatoms Role in Traceability of Soil Microorganisms – A Short Report

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Abstract

Diatoms are one of the most common types of phytoplankton, found seldom in soil but in high amounts in both salty waters and fresh waters, generating almost 20% of the oxygen that the planet produces every year. Diatoms are used in the monitorization of the environment's conditions and also in observations regarding the quality of soil and water, and also in soil microorganisms traceability. The samples have been collected from both soil and Gheorgheni Lake every month during a year at the same date. There is a lack of diatoms in winter (December, January) and reappearing in smaller numbers in February. March is the most prolific month regarding the identified number of species. October is the most abundant month regarding the diatoms per analyzed sample. In November, the number of diatoms is pretty high, but comparing to October, the numbers are lowering. This variation from month to month is mostly due to the water temperature that keeps on changing. If we were to compare November 2017 to November 2018, we can notice a significant rise of diatoms and also a rise in species identified per sample from one year to another. The trophic characterization of aquatic ecosystems based on the phytoplankton indicates a high value of primary production (Polytrophic) in the Gheorgheni Lake. We can observe the seasonal variation of diatom species due to temperature variation specific to each season. The most abundant species identified during the monitoring is *Synedra acus*, having a larger spectrum of temperature in which it grows and it is one of the most resistant when it comes to anthropic pollution.

Keywords: *diatoms, phytoplankton, temperature variation, trophic characterization.*

1. Introduction

The need to identify microbiological parameters of the health and balance of urban ecosystems arose from the desire to change the perception of the population on the natural habitats within an urban settlement [2-3, 11, 17]. The perception of the population on the appearance of a lake can be an indicator in determining the quality of the water even if they do not have the necessary scientific knowledge to identify the problem [4, 6-7].

The population avoids the areas where the lakes/ponds are strongly eutrophic, which have an algal bloom on the surface of the water, and they prefer a clear, clean, unpolluted water surface.
Both soils and lakes have a major contribution to maintaining biodiversity, they are inhabited for a wide range of aquatic species, but there are also reserves of drinking water or catching rainwater [13, 16]. People use lakes in various ways for social activities, but in some cases, eutrophic lakes can be a danger to public health and a danger to the lives of that habitat by developing toxic, highly harmful cyanobacteria [14, 15, 18].

Algae are important bio-indicators of ecosystems, and traceability tools for soil microorganisms because they form the basis of the food chain as primary producers [1, 5, 8-10, 12]. Also, they are good indicators of water quality

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because the abundance of colonies indicates the chemical properties of water such as pH and nutrient levels.

In this paper is presented a study on algae and their annual dynamics both soil and Gheorgheni Lake, located in Cluj-Napoca, Cluj County, Romania. The study was conducted for 12 months, during November 2017 - November 2018.

2. Material and Method

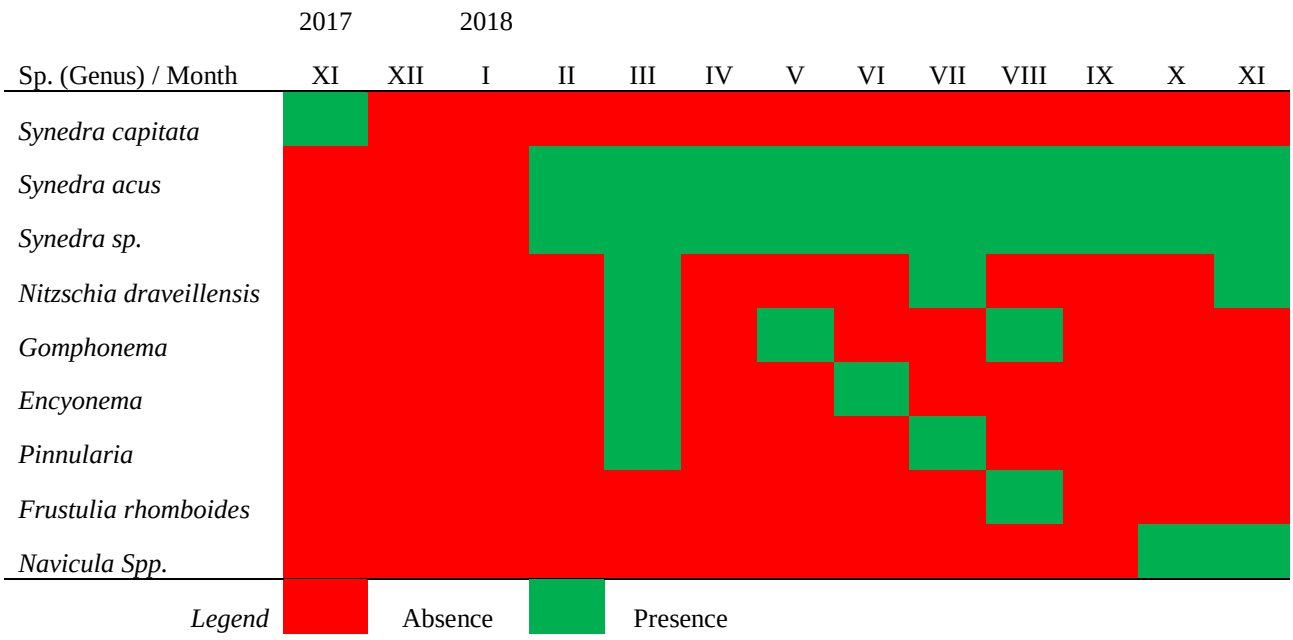
In the process of monitoring the diatoms both soil and Gheorgheni Lake, the sampling of soil and water was carried out every month on 14-15 day around 14-16 pm, in glass containers with lid. For the sampling of water, an easily accessible area was established to facilitate access to a perimeter from which water could be collected together with sludge for accuracy of results in algae monitoring. Different databases, i.e. https://www.landcareresearch. co. nz /home [19] were used in this study, which based on the characteristics of a diatom helps to identify it. Based on the identification the taxonomy of diatoms was also determined, i.e. http://taxonomicon.taxonomy .nl/Default.aspx [20].

In order to identify the diatoms, the following steps were followed: a) determining the type of algae - colonial, filamentous or solitary; b) identification of the type of cell wall; c) determination of cell shape and symmetry.

3. Results and Discussions

Starting with November 2017, the diatoms are very small, nonexistent. The only species identified was *Synedra capitata*, being the only specimen of this species identified throughout the year. In the winter months, December and January the diatoms were non-existent in the samples.

Table 1. Dynamic of algae in soil and Gheogheni Lake ecosystems



In February, the diatoms reappear in the samples. The species identified as *Synedra accus* and *Synedra sp*. The ciliates are present in a small number, being the first evidence in which they appeared. March comes with the greatest diversity of diatoms from the point of view of the species identified in the samples. In addition to *Synedra accus* and *Synedra sp*. The following species of diatoms appear: *Nitzschia draveillensis*, *Encyonema sp*., *Pinnularia sp*., *Gomphonema sp*. In April the number of diatoms is declining.

One possible factor that has influenced this decline is sudden climate change. This month also brings the species of *Synedra* and *Gomphonema* into evidence. Average number of param, and for the first time in the samples we identified a Rotifer and a unique specimen of the species *Lepocinclis oxyuris*. In June the species identified were *Synedra sp*., *Synedra accus*, *Encyonema sp*. with minor differences in July, *Pinnularia sp*. replacing *Encyonema sp.* August brings a small number of diatoms in almost nonexistent specimens, but brings in a new identified species, *Frustulia rhomboides*.

September does not change compared to August on the small number of diatoms, the change coming in October, which is the most abundant in

terms of the number of diatoms per sample analyzed. The number of ciliates this month also increased. In November, 2018, at the end of this study, things are different from November 2017, the beginning of the study. The species identified are *Synedra sp*. and *Gomphonema sp*. in a large number, and the number of paramecia is also increased. The most abundant species identified during the monitoring period is *Synedra accus*, which has a higher temperature range and is among the most resistant to anthropogenic pollution. The trophic characterization of the lake based on phytoplankton indicates a high value of the primary production (eutroph). The seasonal variation of the number of diatom species is determined by the temperature variation as a function of season. After the trophic classification of aquatic ecosystems, Gheorgheni Lake is an eutrophic lake, with a high level of organic matter, abundance of grown plants, low clarity of water.

4. Conclusions

The most prolific months for the development of diatoms were March and October, the two months being the most abundant in terms of the number of diatoms and their variation. The most abundant species identified during the monitoring period is *Synedra acus.*

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