Eco-physiological study on microalgae in Lake Qarun - Fayoum Governorate - Egypt

By

Yassmeen Abd El-Baset Mosad Abd El-Baset

A thesis submitted in partial fulfillment

Of

The requirements for the degree of
PH.D. of Science

In

(MICROBIOLOGY)

BOTANY DEPARTMENT

FACULTY OF SCIENCE

FAYOUM UNIVERSITY

2024

Eco-physiological study on microalgae in Lake Qarun - Fayoum Governorate - Egypt

By

Yassmeen Abd El-Baset Mosad Abd El-Baset

B.Sc. in Botany & Chemistry, Faculty of Science, Fayoum University, 2012

M.Sc. in Microbiology, Faculty of Science, Fayoum University, 2018

Supervision Committee:

1. **Prof. Dr. Tharwat El-Sayed El-Desouky Radwan**
Prof. of Microbiology, Botany Department, Faculty of Science, Fayoum University.

Signature:

2. Prof. Dr. Rawhya Abd El-Latif Salah El-Din
Prof. of Microbiology, Botany Department, Faculty of Science, Al-Azhar University.

Signature:

3. Dr. Hanan Abd Allah Saed Hassan
Assistant. Prof. of Microbiology, Botany Department, Faculty of Science, Fayoum University

Signature:

Approval Sheet

Eco-physiological study on microalgae in Lake Qarun - Fayoum Governorate – Egypt

By

Yassmeen Abd El-Baset Mosad Abd El-Baset

B.Sc. in Botany & Chemistry, Faculty of Science, Fayoum University, 2012

M.Sc. in Microbiology, Faculty of Science, Fayoum University, 2018

This thesis for a PH.D. degree has been discussed and approved by:

The Discussion committee:

1. **Prof. Dr. Tharwat El-Sayed El-Desouky Radwan**

Prof. of Microbiology, Botany Department, Faculty of Science,

Fayoum University.

2. **Prof. Dr. Mohamed Othman Abd El-Monem**

Prof. of Microbiology, Botany and Microbiology Department,

Faculty of Science, Benha University.

3- **Prof. Dr. Medhat Abd El-Fattah Abd El-Mohsen**

Prof. of Microbiology, Botany Department, Faculty of Science,

Bani Suwayf University.

Summary

Qarun Lake is considered as the only enclosed saline lake in Egypt which lies at 83 km of the southwest of Cairo and located in the western desert in the deepest part of El-Fayoum depression. The agricultural drainage water reaches the lake from the surrounding cultivated land by two main drains namely as El-Batts and El-Wadi drains**.**

The concentration of salts, pesticides and other pollutants in the lake were increased due to the continuous water evaporation from such closed ecosystem which also effects on water quality and biology of the lake. Such changes lead to decreasing in the inhabiting biota of the lake.

The main target of the present study was concerned with determining physico-chemical and biological characters of the lake as well as studying the effect of different concentrations of penconazole on some microalgae isolated from the lake. The sampling program was carried out on seasonally basis from autumn 2020 and continued till summer 2021. Eight sampling sites were selected to cover the main differences in water quality of the lake that affected by the agriculture drainage water from the drains.

The data obtained in this study can be summarized in the following points:

1- **Physical analysis** of the lake indicated that water and air temperatures were more or less in the same trend, values of transparency revealed that the water of the lake is considered as a turbid water body, also total dissolved solids (TDS), total solids (TS) and electrical conductivity (EC) were in the same trend and cleared that Qarun Lake suffered from progressive increase of salinity.

2- **Chemical analysis** indicated that pH values were in the alkaline side, increasing of nutrients (ammonium, nitrate, nitrite, phosphate and silicate) in the lake water especially in front of the drains (El-Batts and El-Wadi drains). The alkalinity is characterized by increasing concentrations of HCO_3^- in comparison with CO_3^{-2} at all the selected sites. The DO and BOD maximum value was recorded during autumn while the minimum value was recorded during winter.

3- One hundred and thirteen species of phytoplankton belonging to six divisions were recorded in the lake which were identified morphologically. The recorded divisions were *Dinophyta*, *Bacillariophyta*, *Cyanophyta*, *Chlorophyta*, *Euglenophyta* and *Cryptophyta*.

4- Three of them which are the most common were isolated from water samples collected from the lake and identified molecularly. One blue green alga (*Geminocystis urbisnovae*) and two green algae (*Chlorella vulgaris* and *Tetradesmus dimorphs*).

5- The three algal species were cultivated in suitable media to study the effect of penconazole pesticide on their growth (cell count and chlorophyll *a* content). The growth of the three algal species were decreased as penconazole pesticide concentration increased.

6- *Geminocystis urbisnovae* was recorded as the most tolerant algal species to penconazole pesticide compared to other species.

7- Penconazole has an obvious effect on the shape of *Tetradesmus dimorphs* cells which converted from filiform to circular shape, but the cell shape of *Geminocystis urbisnovae* isn’t affected and slightly changes were appeared on *Chlorella vulgaris* shape.

8- Different concentrations of penconazole pesticide illustrated that at the lower concentrations of PEN the carbohydrate content is slightly affected but the higher doses decreased the carbohydrate content.

9- The highest protein content was found in *Geminocystis urbisnovae* followed by *Chlorella vulgaris* then *Tetradesmus dimorphs* at all the concentrations except at the higher concentration 4 mg/l where the protein content of *Chlorella vulgaris* cells is the highest followed by *Tetradesmus dimorphs* then *Geminocystis urbisnovae.*

Conclusion:

- The increased nutrient level in the lake by time show an exacerbated problem of eutrophication which lead to economic effect on fish production.
- Blooming has no toxic effect on fauna of the lake due to the dominant species recorded are not toxic and there was not any record of fish mortality due to the blooming phenomenon recorded in the lake.
- *Geminocystis urbisnovae* was recorded as the most tolerant algal species to penconazole pesticide compared to other species which can be used in other applications.