PRODUCTION OF RAW MATERIALS FROM CYANOBACTERIA FOR BIOFERTILIZERS INDUSTRY

By

IMAN MUHAMMAD SELIM MUHAMMAD
B. Sc. Agric. Sci., (Biotechnology), Fac. Agric., Cairo Univ., 2009

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

In

Agricultural Sciences
(Agricultural Microbiology)

Department of Agricultural Microbiology
Faculty of Agriculture
Cairo University
EGYPT

2015

APPROVAL SHEET

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SUPERVISION SHEET

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Name of Candidate: Iman Muhammad Selim Muhammad **Degree:** M. Sc.

Title of Thesis: Production of Raw Materials from Cyanobacteria for Biofertilizers Industry.

Supervisors: Dr. Aziz Mohamed Aziz Higazy
Dr. Olfat Sayed Barakat
Dr. Mohamed Saad Aly

Department: Agricultural Microbiology **Approval**: / /

ABSTRACT

El-Khadra lake was physically, chemically and microbiologically evaluated at surface layer and depths of 30 cm, 1 meter and sediment water in September 2011 and February 2012. Physico-chemical analysis of lake water samples revealed the alkaline nature of the lake with high concentrations of Na^+ and Cl^- ions at all depths in both seasons. Na^+ ion concentrations ranged from 27.124 to 30.569 g/l in September samples and from 9.235 to 9.734 g/l in February samples, while Cl^- ions ranged from 15.606 to 21.275 g/l in September samples and from 10.686 to 11.928 g/l in February samples. Higher bacterial counts were detected in sediment water samples in both seasons (990 and 910 cfu/ml in September and February samples, respectively). Fungal counts were higher in September samples at 1meter depth (290 cfu/ml), while in February samples, the higher fungal counts were recorded at 30 cm (110 cfu/ml). Total and feacal coliforms scored few numbers in both seasons. Many cyanobacterial species besides some algae were detected in the lake including *Chlorella*, circular diatom (*Puncticulata* sp.), *Oscillatoria, Spirulina*, *Nostoc* and *Anabaena* spp. Among those, three representative species were isolated and identified by TEM and molecular techniques as *Spirulina* sp., *Oscillatoria* sp and *Anabaena* sp. Their intra- and extra-cellular extracts showed no considerable influence on brine shrimp eggs and mice survival. However, they showed also considerable antimicrobial activities against five microorganisms *i.e., E.coli, S. aureus, P. aeroginosa, B. subtilis* and *A. niger*. Chemical analysis of cyanobacterial isolates showed that *Spirulina* had the highest protein percentage and amino acids content in addition to appreciable amounts of phytohormones. *Oscillatoria* recorded higher content of photosynthetic pigments including phycobiliproteins.

On the other hand, a pot experiment was performed to examine the effect of foliar application of cyanobacterial cultures, filtrates and dried biomasses that were dissolved either in water or in culture filtrate on pepper seedlings. *Spirulina*-treated plants showed more enhanced plant growth than control and other treated plants. Data also indicated that plants treated with *Spirulina* culture and filtrate showed some wilting symptoms. Therefore, a confirmation pot experiment was performed to examine the effect of different concentrations of *Spirulina* culture filtrate on the vegetable plant. The dilution ratio of 1:2 (filtrate: water) showed the most enhanced growth parameters compared with control plants.

Key words: El-Khadra Lake, cyanobacteria, *Spirulina, Oscillatoria, Anabaena*, antimicrobial activity, foliar application, pepper, biofertilization.

DEDICATION

I dedicate this work to whom my heartfelt thanks; to my parents and my brothers for their patience help and for all the support they lovely offered along the period of my post graduate studies.

ACKNOWLEDGEMENT

*Praise and thanks be to **ALLAH**, for assisting and directing me to the right way.*

*I wish to express my sincere thanks, deepest gratitude and appreciation to **Dr. Aziz Mohamed Aziz Higazy,** Professor of Agricultural Microbiology, Faculty of Agriculture, Cairo University for supervision. He was always available for my questions and he was positive and gave generously of his time and vast knowledge. He always knew where to look for the answers to obstacles while leading me to the right perspective.*

*I must offer my profound gratitude to **Dr. Olfat Sayed Barakat,** Professor of Agricultural Microbiology, Faculty of Agriculture, Cairo University for supervision, continued assistance and guidance through the course of my study. Her enthusiasm, encouragement and faith in me throughout have been extremely helpful.*

*Sincere thanks are also due to **Dr. Mohamed Saad Aly**, Researcher Professor of Agricultural Microbiology, Agricultural and Biological Research Division, National Research Center, Giza for suggesting the problems, sharing in supervision and continued assistance.*

*Special deep appreciation is given to **Dr. Khaled Emara**, Associate Professor of Botany, Faculty of Agriculture, Cairo University for his guidance and assistance in histology part of the thesis.*

*I am also grateful to **Dr. Haggag Zein**, Associate Professor of genetics, Faculty of Agriculture, Cairo University for his appreciable help in molecular part of the thesis.*

Grateful appreciation is also extended to all staff members and colleagues in the Agricultural Microbiology Department, Faculty of Agriculture, Cairo University for their help and support.

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