شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

Faculty of Women forArts,

Science and Education,

Ain Shams University

Bioremediation of cyanide compounds by using some transgenic micro algal species

Thesis

Submitted in Partial Fulfillment of the

Requirements for the degree of Master of Science

In

Botany (Algae)

BY

Rasha Abed Abd El-monem Mohammed

B.Sc. in Chemistry and Botany (2013)

SUPERVISORS

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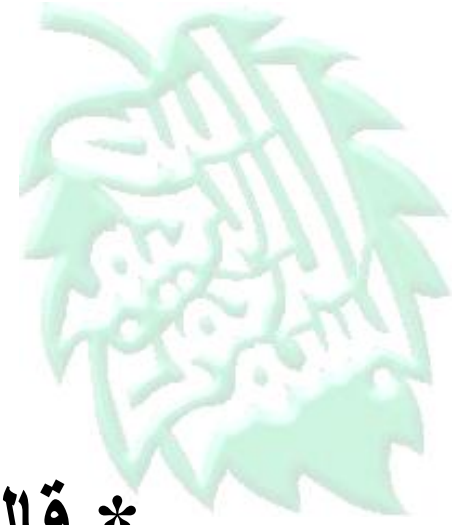
2022



* قالوا سـبحانك
لا علم لـنا إلا ما علمتنـا
إنك أنت العـليم الحـكيم *

"سورة البقرة الآية 32"

Approval Sheet

Name: Rasha Abed Abd El-Monem Mohammed

Title: Bioremediation of cyanide compounds by using some transgenic micro algal species

Supervisors

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Rasha Abed

DEDICATION

To my Mother, who taught me the first words of my life.

To my Father, who taught me depending on myself.

To my Brother, who taught me what "brotherhood"means.

To my Sister, who taught me what "sisterhood" means.

To my Husband, who showed me the pleasure of life.

To my Sons, Anas&Mostafa, who taught me to look to the future.

To everyone who enjoys this work

Introduction

The pollution and contamination are the most threaten to the whole world. This pollutant is usually arising from various development activities. The population explosion in the world has resulted in an increase of polluted water**.** The water quality is one of the most important character due to its effects on human health as well as plant growth. Earth atmosphere and natural waters are polluted by municipal, industrial and agricultural wastes **(McGrath *et al*., 2001)**.

Cyanide (CN^-) and its oxidation product cyanate are dangerous toxic chemicals produced through human activities and industries such as leaching, electroplating, steal production, plastics, and synthetic fibers **(Hamel, 2011)**.

Cyanide is fast-acting broad spectrum toxin and it affects all living organisms. Cyanide ion exerts an inhibitory action on certain metabolic enzyme systems, most notably cytochrome oxidase, the enzyme involved in the ultimate transfer of electrons to molecular oxygen.

Due to high toxicity of cyanide as strong inhibitor of cytochrome oxidase, it is inevitable to degrade cyanide in industrial effluents or remediate contaminated soil and water

to reduce its level to permissible limit of 0.2 mg L^{-1} in effluents **(Kumar *et al*., 2013; Kumar *et al*., 2015).**

Cyanide and cyanate compounds are detoxified mainly by chemical treatments involving chlorination reaction **(Akcil and Mudder, 2003).** However, these chemical treatments may have draw-backs due to the high costs and/or production of hazardous byproducts **(Yu *et al*., 2006; Srivastava and Muni, 2010).**

Bioremediation systems involving the usage of plants or microorganisms are eco-friendlier and affordable alternatives **(Akcil and Mudder, 2003)**.

Microbial detoxification of cyanide in mine wastewaters has an advantage over conventional chemical methods because of its low treatment cost, in-situ treatment, complete detoxification and its natural non-toxic products **(Adams *et al*., 2001; Mirsanjari and Ardakani, 2021).**

In living organisms, cyanase enzyme is important for degradation and/or removal of the toxic cyanide and cyanate compounds affecting their growth **(Ebbs, 2004).** However, biodegradation systems are probably inefficient because of the accumulation of toxic microbial metabolites and/or overloading with excess pollutant **(Ebbs, 2004).**

Bushey *et al.*, (2006); Yu *et al.*, (2006) showed that phytoremediation using vascular plants and algal systems became preferable alternatives for detoxification of cyanate and cyanide contaminantion because their large surface: volume ratios, efficient uptake and storage systems **(Taebi *et al.*, 2008).**

Phytoremediation technologies are become recognized as low cost- effective methods for remediating sites contaminated with toxic metals such as soil replacement, solidification and washing strategies **(Chaney *et al.*, 1997;Flathman and Lanza, 1998)**.

Algae have been widely used to evaluate the impacts of metal, herbicide and other persistent xenobiotic contamination and bioavailability in aquatic systems **(Stauber and Davies, 2000; Qian *et al.*, 2008a; Qian *et al.*, 2008b).**

The algae have many features that make them ideal candidates for the selective removal of heavy metals, ability to grow both autotrophically and heterotrophically, large surface area/volume ratios, phototaxy, expression and potential for genetic manipulation **(Cai *et al.*, 1995).**

Macro algae have been used extensively to measure heavy metal pollution in marine environment throughout the world. Several species of the green alga *Enteromorpha* and/or *Cladophora* have been utilized to measure heavy metal levels in many parts of the world **(Al-Homaidan *et al*., 2011)**.

Aim of the work

This study provides an effective eco-friendly phytoremediation system for cyanide detoxification using micro- algae by:

1-Production of transgenic algal species carries gene specific to cyanase enzyme by cloning process of cyanase gene in *chlamydomonas reinhardtii.*

2-Investigation the ability of both wild and transgenic algae in cyanide degredation.

3-Determination the optimal pH for the activity of modified transgenic algal species to degrade cyanide element in polluted water samples and compare it with wild type.