

**Microbiological and molecular studies on oxalate
degrading enzymes isolated from bacteria living
in Egyptian fertile soil**

Thesis

**Submitted for the Fulfillment of the degree Doctor of
Philosophy (PhD) in**

Microbiology

By

Mona Kilany Abd El Gawad Kilany

(M. Sc. Microbiology 2006)

Microbiology Department

Faculty of Science

Ain Shams University

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2012

دراسات ميكروبيولوجية وجزئية على الانزيم
المسؤول عن تحليل مادة الاكزلات والمستخلص من
البكتريا المعزولة من التربة المصرية

رسالة مقدمة

للحصول على درجة دكتوراه الفلسفة في العلوم
(الميكروبيولوجي)

من الطالبة

منى كيلاني عبد الجواد كيلاني

(ماجستير في العلوم / ميكروبيولوجي- ٢٠٠٦)

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Summary

The oxalotrophic bacteria is of great importance in reducing urinary excretion of oxalic acid, since the high oxalate level is one of the important virulence factors for hyperoxaluria, urolithiasis, cardiomyopathy, and renal failure. Oxalate decarboxylase (EC 4.1.1.2) catalyzes the conversion of oxalate to carbon dioxide and formate. The oxalate decarboxylase has commercial uses such as in the brewing industry or for agronomic uses such as to reduce susceptibility of a plant to oxalic acid and phytopathogens, clinical oxalate determination, bioremediators, plant growth promoters, antinematodal and antifungal activity.

In the current work, mesophilic bacteria were isolated from different fertile soil samples obtained from several governorates. Isolation resulted in several isolates. Screening of the bacterial isolates was carried out according to their ability to degrade oxalate. Screening resulted in 16 isolates designated as: SK- 1, SK- 2, SK- 3, SOG- 1, SOG- 2, SOG- 3, TG- 1, TG- 2, TG- 3, PG- 1, PG- 2, MG- 1, MG- 2, CG- 1, CG- 2, CG- 3 and SOG- 1. Among the selected isolate 6 isolate showed the highest potential of oxalate degradation.

Characterization of the selected isolate showed that it was highly sensitive to Ofloxacin (5µg), Ceftazidime (30 µg), Claforan cefotaxime (30 µg), Cefoperazone (75 µg), Ciprofloxacin (5 µg), moderately sensitive to Tobramycin (10 µg), Sulphamethazole trimethoprim (25 µg), Cefepime (30 µg), Erythromycin (15 µg),

APPROVAL SHEET

Title of the Thesis:

Microbiological and molecular studies on
Oxalate degrading enzymes isolated from
Bacteria living in Egyptian fertile soil

Degree : Doctor of Philosophy (PhD) in
Microbiology

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Date of examination: / / 2012

**This thesis has not been previously submitted for
any degree at this or at any other university.**

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ACKNOWLEDGEMENT

First and foremost, all thanks are due to **Allah**, the source of all success in my life.

When I sit to write this page numerous faces came across in my mind to whom I am indebted from the beginning of this venture and without all those timely help I couldn't have completed this work.

My deep thanks and greetings are to my **parents**, who grant me their whole life and did their best to help and support me.

First of all, I really find myself luckily to be supervised by **Prof. Dr. Hala M. Abou Shady**, assistant Professor of Microbiology, Microbiology Department, Faculty of Science Ain Shams University. I am really grateful to her sincere and continuous support and encouragement to complete this study and brought this study to the fruition. She earnestly extended the gracious help academically as well as administratively to ensure smooth progress of this work.

No words could express my deep appreciation and gratitude to **Dr. Kadria A. Genedi**, Lecturer of Microbiology, and Microbiology Department National Organization for Drug Control and Research. I am really owed much to her for her continuous support and scientific experience she gave me.

Special thanks are to **Dr. Wafaa F. Ahmed**, Lecturer of Microbiology, Ain Shams University specialized hospital for continuous guidance, fruitful discussion, encouragement, excellent advice.

All my thanks to **Prof. Dr. Essam I. Hassan**, Professor of Immunology and Biotechnology, National Organization for Research & Control of Biologicals, for having seen so wonderfully kind and thoughtful, helping me patiently and skillfully in innumerable ways and great tolerance that support me to finish this work.

I am very grateful to **Dr. Khalid El Gayar**, Lecturer of Biotechnology, VACSERA, for his sincere and grateful cooperation to support this work.

No words suffice to thank **Dr. Hend El Deeb**, Consultant Epidemiologist, GOTHI, for her great help and patience.

I extend my sincere and heartfelt gratitude to **Dr. Mona I. Mabrouk**, Lecturer of Microbiology, Microbiology Department National Organization for Drug Control and Research for splendid help and valuable co-operation.

List of abbreviations

16S rRNA	: Ribosomal 16S ribonucleic acid
API 20NE	: Analytical Profile Index
ATCC	: American type culture collection
Bcc	: <i>Burkholderia cepacia</i> complex
BUG	: Biolog reader universal growth
BSA	: Bovine serum albumin
CaOx	: Calcium oxalate
CCS	: Continuous culture system
CF	: Cystic fibrosis
Cm	: <i>Coniothyrium minitans</i>
E.C.	: Enzyme Commission number
EDTA	: Ethylene diamine tetra acetic acid
Frc	: Formyl-CoA transferase
GIT	: Gastrointestinal tract
HPLC	: High performance liquid chromatography
kDa.	: Kilo Dalton
MLST	: Multilocus sequence typing
MnSODase	: Manganese dependent oxalate decarboxylase
MnSODase	: Manganese-dependent superoxide dismutase
NAD ⁺	: Nicotinamide adenine dinucleotide
NADP ⁺	: Nicotinamide adenine dinucleotide phosphate.
Oxc	: Oxalyl-CoA decarboxylase
OxdC	: Cytosolic oxalate decarboxylase
OXDC	: Oxalate decarboxylase
OXOX	: Oxalate oxidase
PBS	: Phosphate buffered saline

PCR	: Polymerase chain reaction
PHDC (RT-46 complex)	: Philadelphia-District Columbia strain
pKa	: Acid dissociation constant
PPFM	: Pink-pigmented facultative methylotrophs
RAPD	: Randomly amplified polymorphic DNA typing
<i>recA</i> gene	: Protein essential for repair and recombination of DNA
RFLP	: Restriction fragment length polymorphisms
Rnn operons	: Ribosomal RNA gene groups
RT-88 complex	: Mid-west strain
SCAN- W/A	: Microscan WalkAway-96
SDS-PAGE	:Sodium dodecyl sulfate polyacrylamide gel electrophoresis
ST	: Sequence types
T.S.S.	: Trace salts solution
TEMED	: N, N, N',N' tetramethylene diamine
TPP	: Thiamine pyrophosphate

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