



شبكة المعلومات الجامعية





# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية

# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

## قسم

نقدم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
على هذه الأفلام قد أعدت دون أية تغيرات



## يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٤٠-٢٠%

To be Kept away from Dust in Dry Cool place of  
15-25- c and relative humidity 20-40%



# بعض الوثائق الاصليّة تالفة



# بالمقالة صفحات لم ترد بالاصل



٢٠٠  
ج

***NEW BIOAPPROACH FOR THE PRODUCTION OF  
THE MANURE FROM ORGANIC WASTES AND  
THEIR APPLICATION ON DESERT SOIL***

*BY*

**Amal Mohamed Omar Salem**

B.Sc., Sceince Ain shams University (1995)  
Master of Scinece, El-Zagazng University (2001).

**A Thesis  
Submitted for Doctor of Philosophy**

**In  
(Microbiology)**

**Department of Botany  
Faculty of Science  
Benha University**

**2006**



**NEW BIOAPPROACH FOR THE PRODUCTION OF  
THE MANURE FROM ORGANIC WASTES AND  
THEIR APPLICATION ON DESERT SOIL**

**BY**

**Amal Mohamed Omar Salem**

B.Sc., Sceince Ain shams University (1995)  
Master of Scinece, El-Zagazng University (2001).

**A Thesis  
Submitted for Doctor of Philosophy  
In  
(Microbiology)  
Under Supervision**

**Prof. Dr.**  
**Mahmoud A. Swelim**  
Prof. and Head of Botany Dept.  
Faculty of Science,  
Benha University

**Prof. Dr.**  
**Bouthaina F. Abd El Ghany**  
Prof. and Head of Soil Microbiol. Unit  
Dept. of Soil Fertility and Microbiology  
Desert Research Center

**Dr.**  
**Mahmoud M. Amer**  
Ass. Prof. of Micrbiology, Botany Dept.  
Faculty of Science  
Benha University

**Dr.**  
**Seham M. Shash**  
Ass. Prof. of Micrbiology, Botany Dept.  
Faculty of Science  
Benha University

**Department of Botany  
Faculty of Science  
Benha University**

**2006**



## DEDICATION

*To my mother's spirit*

*A lot of thanks for your kind and continuous  
support and encouragement during all my life.*

## ***ACKNOWLEDGEMENT***

I am indebted to ALLAH, the most gracious and the most merciful, the bounties of whom I can never reckon.

This work has been carried out under the supervision and direction of Prof. Dr. M.A. Sweilam, Prof. and Head of Botany. Dept., Fac. Science, Benha, Prof. Dr. Bouthaina, F. Abd El-Ghany, Prof. and Head of Soil Microbiol. Unit, Dept. of Soil Fertility and Microbiology, Desert Res. Center, Ass. Prof. Mahmoud M. Amer, Dr. of Microbiology, Botany Dept. Fac. Science, Benha, Seham M. Shash Ass. Prof. of Micrbiology, Botany Dept. Fac. Science, Benha.

Thanks for them for their effective and fruitful discussions, suggesting and supervising this works.

I would like to express my sincere gratitude for all the staff members and workers in Microbiology Unit, D.R.C. for their continuous assistance and supplying all facilities throughout this work.

Last, I would like to express my everlasting gratitude and respect to my husband and my parents for their unlimited patience, continuous support and encouragement.

# CONTENTS

	Page
<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. REVIEW OF LITERATURE .....</b>	<b>2</b>
2.1. Definitions .....	2
2.1.1. Cellulose .....	2
2.1.2. Cellulases .....	2
2.2. Structural unit of cellulose.....	2
2.3. The mechanism of the enzymatic hydrolysis of cellulose .	3
2.4. The factors affecting the action of cellulolytic enzymes ....	7
2.4.1. Effect of carbon and nitrogen source .....	7
2.4.2. Effect of Incubation period.....	10
2.4.3. Effect of Temperature .....	11
2.4.4. Effect of pH .....	13
2.4.5. Effect of activators and inhibitors .....	15
2.5. Definitions. ....	18
2.5.1. Compost .....	18
2.5.2.Composting.....	18
2.6. The benefits of using compost . Anonymous (1989). ....	18
2.7. Factors affecting the decomposition process.....	19
2.7.1. Appropriate microbial populations .....	19
2.7.2. Sufficient aeration.....	22
2.7.3. Temperature .....	24
2.7.4. C/N ratio.....	25
2.8 Effect of compost on .....	27
2.8.1. Soil fertility.....	27
2.8.2. Yield and productivity.....	29
2.8.3. Oil production .....	35
<b>3. MATERIALS AND METHOD.....</b>	<b>38</b>
3.1. MATERIALS .....	38
3.1.1. Location of the agricultural experiments .....	38
3.1.2. Organic materials .....	38
3.1.2.1. Rice straw .....	38

3.1.2.2. Garbage.....	38
3.1.2.3. Organic manure.....	38
3.1.3. Chemical accelerator of composts .....	38
3.1.4. Inorganic fertilizers .....	40
3.1.5. Inoculants.....	40
3.1.5.1. Cellulolytic agents.....	40
3.1.5.2.Biofertilizer agents .....	40
3.1.6.Cultivars.....	40
3.1.7. Media used.....	40
3.1.8. Reagents.....	44
<b>3.2. METHOD.....</b>	<b>45</b>
3.2.1. Isolation and purification of cellulolytic fungi and bacteria .....	45
3.2.2. Selection of the most active cellulolytic isolates ...	46
3.2.3.Estimination of Glucose.....	46
3.2.4.Identification of the most active isolates .....	47
3.2.4.1.Identification of the cellulolytic fungus isolate. ....	47
3.2.4.2. Identification of the cellulolytic bacterial isolate. ....	47
3.2.5.Trials for maximizing the cellulolytic activities of most active strains . ....	47
3.2.5.1. Effect of different cellulose sources (carbon source ) .....	48
3.2.5.2. CMC concentration (as a sole carbon source). 48	48
3.2.5.3. Effect of incubation period . ....	48
3.2.5.4. Effect of incubation temperature.....	48
3.2.5.5. Effect of pH on the medium. ....	48
3.2.5.6. Effect of Nitrogen source .....	49
3.2.5.7. Effect of metallic ions. (Micronutrients). ....	49
3.2.5.8.Effect of vitamins. ....	50
3.2.6. Preparation of crude enzymes from each cellulolytic strains . ....	50
3.2.7.Assay of cellulose activity (CMCase) .....	51
3.2.8.Assay of cellulolytic enzymes activity. ....	51

3.2.8.1. Fpase activity .....	51
3.2.8.2. CMCase activity . (Cx activity) .....	51
3.2.8.3. Exo- Cellobiohydrolase activity (C <sub>1</sub> ). ....	51
3.2.8.4. Cellobiose assay for beta glucosidase.....	52
3.2.9. Estimation of Protein. ....	52
3.2.10. Isolation and selection of most active phosphate dissolving bacteria . .....	52
3.2.11. Method of composting the wastes on small scale.	53
3.2.12. Composting of the wastes on large scale .....	53
3.2.13. Chemical analysis of compost. ....	54
3.2.14. Microbiological analysis of compost samples. ....	54
3.2.15. Field experiment. ....	55
3.2.16. Parameters measured.....	57
3.2.16.1. Plant parameters for each plant type.....	57
3.2.16.2. Microbiological analysis .....	57
3.2.17. Statical analysis. ....	58
<b>4. RESULTS.....</b>	<b>59</b>
4.1. Isolation of the cellulolytic bacteria and fungi.....	59
4.2. Assay of cellulase activity of cellulolytic bacterial and fungal isolates .. ....	59
4.3. Identification of the most active cellulolytic bacterial and fungal isolates .. ....	59
4.4. Effect of nutritional and environmental requirements on the cellulose activity. ....	59
4.4.1. Effect of different carbon source. ....	59
4.4.2. Effect of CMC concentrations. ....	59
4.4.3. Effect of incubation period. ....	64
4.4.4. Effect of incubation temperature.....	64
4.4.5. Effect of pH. ....	64
4.4.6. Effect of different nitrogen sources. ....	64
4.4.7. Effect of trace elements.....	74
4.4.8. Effect of vitamins. ....	74
4.4.9. Media and condition recommended for maximum enzyme activity.....	74

4.5. Detection of cellulase (CMCase ) activity of the most active cellulolytic strains .....	79
4.6. Assay of different cellulases of the most active cellulolytic strains . ....	79
4.7. Selection of the most active phosphate dissolving bacteria ( PDB ) isolates.....	79
4.8. Composting of rice straw and garbage. ....	79
4.8.1. On small scale .. ....	84
4.8.1.1 Chemical analysis. ....	84
4.8.1.1.2. Microbiological analysis.....	84
4.8.2. Composting of rice straw and garbage at Maryat station (on large scale). ....	87
4.8.2.1. Microbiological analysis. ....	87
4.8.2.2. Chemical analysis .....	87
4.9.1. Microbial densites of sun flower . ....	90
4.9.1.1. Total microbial count .. ....	90
4.9.1.2. Phosphate dissolvers. ....	93
4.9.1.3. Azotobacters.....	93
4.9.1.4. Cellulose decomposers.....	93
4.9.2. Plant characteristics of sun flower . ....	100
4.9.2.1. Plant height. ....	100
4.9.2.2. Shoot fresh weight. ....	103
4.9.2.3. Shoot dry weight.....	103
4.9.2.4. Chlorophyll content.....	108
4.9.2.5. Stalical analysis .....	108
4.9.2.6. Disc diameters and yield. ....	112
4.9.2.7. Weight of 1000 seeds and oil % .....	112
4.9.2.8. Statical analysis .....	112
4.9.3. The microbiological characteristics of corn rhizosphere .. ....	118
4.9.3.1. Total microbial counts .. ....	118
4.9.3.2. Phosphate dissolving bacteria ( PDB ).....	118
4.9.3.3. Azotobacters .. ....	123
4.9.3.4. Cellulose decomposers count .. ....	123
4.9.4. Plant Characterestics of corn. ....	128

4.9.4.1. Height of plant .....	128
4.9.4.2. Shoot fresh weight .....	128
4.9.4.3. Shoot dry weight .....	133
4.9.4.4. Chlorophyll content.....	133
4.9.4.5. Statical analysis .....	138
4.9.4.6. Weight of kernel and yield .....	138
4.9.4.7. Weight of 100 seeds and oil %.....	142
4.9.4.8. Statical analysis.....	142
<b>5. DISCUSSION AND GENERAL CONCLUSION.....</b>	<b>146</b>
<b>6. SUMMARY.....</b>	<b>151</b>
<b>7. REFERENCE .....</b>	<b>157</b>
<b>ARABIC SUMMARY .....</b>	

## ***LIST OF TABLES***

No.	Title	Page
1.	Soil physical and chemical analyses of investigated area Maryut soil.	39
2.	Isolation of the cellulolytic bacteria and fungi .	60
3.	Assay of cellulase activity ( EU ) of cellulolytic bacterial and fungal isolates	61
4.	Effect of different carbon source (substrates)on the cellulase activity of most active cellulolytic strains .	65
5.	Effect of CMC concentration on the cellulase activity of most active cellulolytic strains .	66
6.	Effect of incubation periods on the cellulose activity of most active cellulolytic strains .	66
7.	Effect of incubation temperature on the cellulase activity of most active cellulolytic strains .	69
8.	Effect of pH on the cellulase activity of most active cellulolytic strains .	69
9.	Effect of different nitrogen sources on the cellulase activity of most active cellulolytic strains .	72
10.	Effect of addition of different trace elements on the cellulase activity of most active cellulolytic strains .	75
11.	Effect of vitamins on the cellulase activity of most active cellulolytic strains .	76
12.	Media and condition recommended for the maximum production of cellulases activity .	78
13.	Detection of cellulase (CMC ase ) activity of the most active cellulolytic strains .	80
14.	Assay of different cellulases of the most active cellulolytic strains .	81
15	Estimation of pH of the modified Bunt Rovera medium contained rock phosphorus and inoculated with phosphate dissolving bacteria ( PDB ) isolates.	82