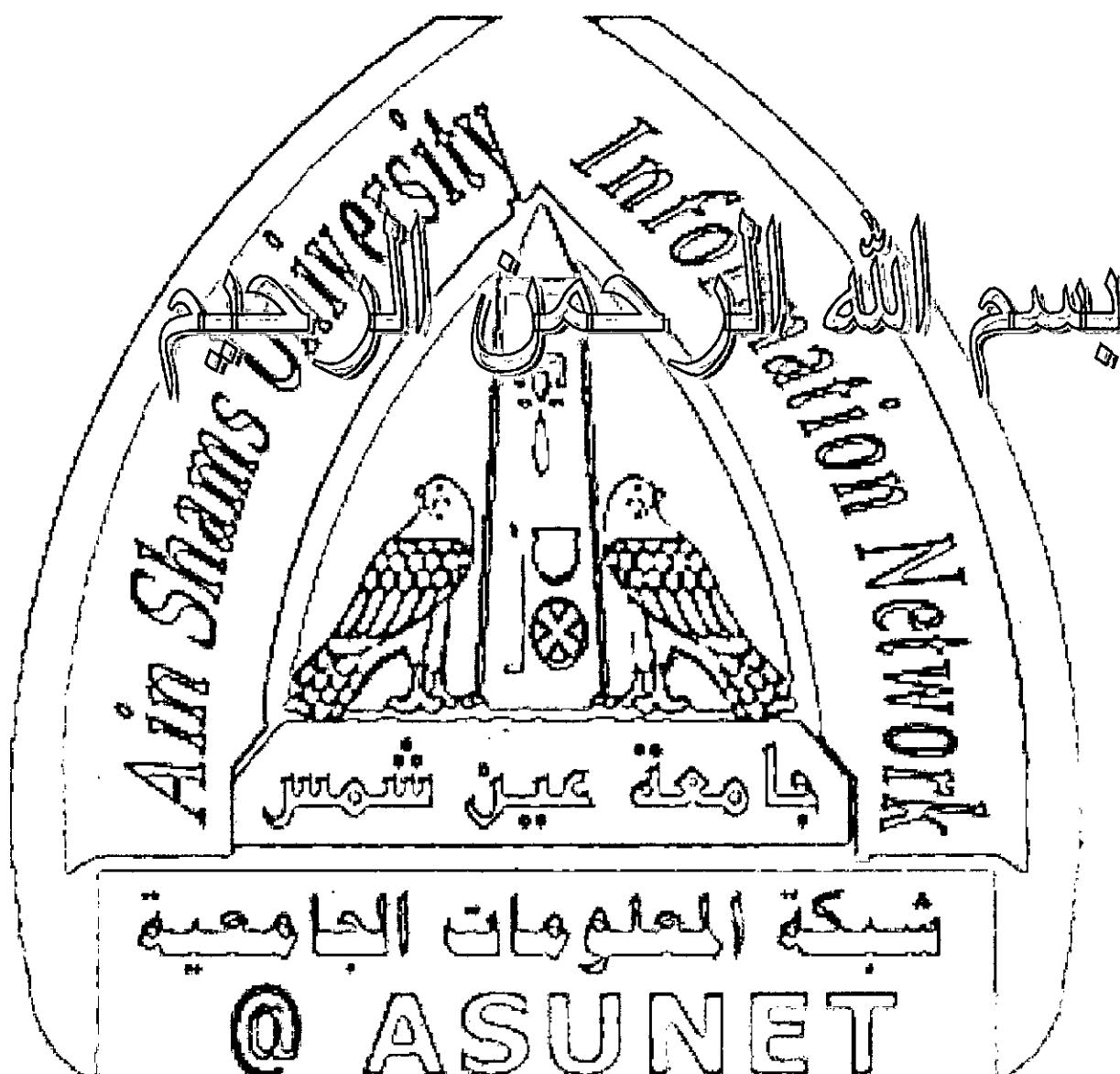




شبكة المعلومات الجامعية





شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

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



يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

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

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

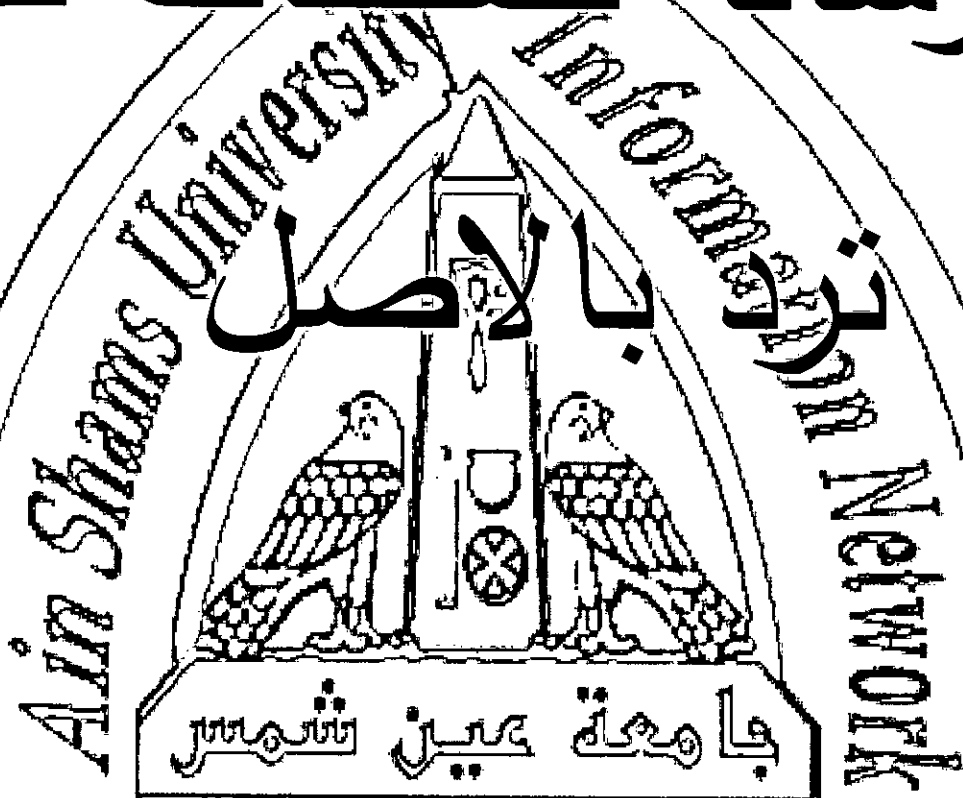


شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم

بعض المؤلفات
شبكة المعلومات
Ain Shams University
International Network
جامعة عين شمس

شبكة المعلومات الجامعية
@ ASUNET

بالرسالة صفحات لم



شبكة المعلومات الجامعية
@ ASUNET



Minufiya University
Faculty of Agriculture
of Soil Science Department

RESPONSE OF WHEAT PLANTS GROWN ON LOW CATION EXCHANGE CAPACITY SOILS TO FERTILIZATION WITH POTASSIUM

By

Bashir Abou-Baker Hassan El-Gamal

B. Sc. Agric. Sci. (Soil Science), Minufiya University (2003)

A Thesis

Submitted in Partial Fulfillment of the Requirement

For the Degree

of

MASTER OF SCIENCE

in

**Agricultural Science
(Soil Science)**

**Department of Soil Science
Faculty of Agriculture
Minufiya University**

2008

CS 01 00

CREDIT SHEET

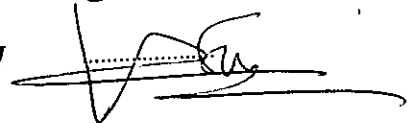
**Title of Thesis: RESPONSE OF WHEAT PLANTS
GROWN ON LOW CATION EXCHANGE CAPACITY
SOILS TO FERTILIZATION WITH POTASSIUM**

Presented by : Bashir Abou-Baker Hassan El-Gamal

Supervision Committee:

Prof. Dr. Mohamed Mohamed Hamada Shalaby
Prof. of Plant Nutrition, Faculty of
Agriculture, Minufiya University

Signature



Prof. Dr. El-Husieny Abd El-Ghaffar Abou Hussien Abou Hussien
Prof. of Soil Chemistry, Faculty of
Agriculture, Minufiya University

Prof. Dr. Ibrahim Mohamed El-Naggar
Head Researcher of Soil Physics and Chemistry
Soil. Water and Environment Research Institute
Agricultural Research Center (El-Gemmieza)

Ibrahim El-Naggar

Date: 27/1 / 2008

APPROVAL SHEET

Title of Thesis: RESPONSE OF WHEAT PLANTS GROWN ON LOW CATION EXCHANGE CAPACITY SOILS TO FERTILIZATION WITH POTASSIUM

**Submitted to: DEPARTMENT OF SOIL SCIENCE,
FACULTY OF AGRICULTURE, MENOUEFIYA UNIVERSITY**

Name : Bashir Abou-Baker Hassan El-Gamal

For the Degree of Master of Agricultural Science (Soils)

This thesis has been approved by :

Prof. Dr. Ali Mohamed Ahmed Abd El-Haleem **Signature** *A.A. Haleem*
Prof. of Plant Nutrition, Faculty of
Agriculture, Moshtohor Benha University

Prof. Dr. Saleh Mohamed Aly *Saleh M. Aly*
Prof. of Soil Physics, Faculty of
Agriculture, Minufiya University

Prof. Dr. Mohamed Mohamed Hamada Shalaby *M. Shalaby*
Prof. of Plant Nutrition, Faculty of
Agriculture, Minufiya University

Prof. Dr. El-Husieny Abd El-Ghaffar Abou Hussien *Abou Hussien*
Prof. of Soil Chemistry, Faculty of
Agriculture, Minufiya University

Committee in Charge

Date: 27 / 1 / 2008

ACKNOWLEDGMENT

The author wishes to express his profound gratitude and sincere appreciation to **Prof. Dr. Mohamed Mohamed Hamada Shalaby**; Prof. of Plant Nutrition, Soil Dept. Fac. of Agric. Minufiya University; **Prof. Dr. El-Husieny Abd El-Ghaffar Abou Hussien**, Prof. of Soil Chemistry, Soil Dept. Fac. of Agric. Minufiya University for suggesting the problem, supervision, guidance, sincere help and constructive criticism throughout the course of study.

Deep thanks and appreciation are extended to **Prof. Dr. Ibrahim Mohamed El-Naggar**, Head Researcher of Soil Physics and Chemistry, Soil Water and Environment Research Institute, El-Gemmeiza Research Station for his supervision, guidance through all steps of this work and continues encouragement.

Thanks are also extended to the staff members of Soil Science Department, Faculty of Agriculture, Minufiya University as well as all members of the El-Gemmeiza Research Station for Providing the Facilities and Cooperation.

Deep gratitude is also due to my family for their patient, continuous help and encouragement during the execution of this work.

CONTENTS

	Page
1-INTRODUCTION	1
2-REVIEW OF LITERATURE	
2.1. Extractability of available as affected by extraction methods.	4
2.2. Effect of some physical and chemical properties of soil on potassium forms	5
2.3. Effect of different sandy soils on potassium forms	6
2.3.1. Total potassium	6
2.3.2. Fixed potassium	7
2.3.3. Exchangeable potassium	8
2.3.4. Soluble potassium	10
2.4. Effect of different sandy soils on wheat growth	11
2.4.1. Grain yield	11
2.4.2. Straw yield	12
2.4.3. Yield components	13
2.5. Effect of different sandy soils on chemical composition of wheat plants	14
2.5.1. Potassium content	14
2.5.2. Nitrogen content	15
2.5.3. Phosphorus content	16
2.6. Effect of different sandy soils on water relations	16
2.6.1. Consumptive use	16
2.6.2. Water use efficiency	18
2.7. Effect of irrigation regime on potassium forms	18
2.7.1. Total potassium	18
2.7.2. Fixed potassium	19

2.7.3. Exchangeable potassium	19
2.7.4. Soluble potassium	22
2.8. Effect of irrigation regime on wheat growth	21
2.8.1. Grain yield	21
2.8.2. Straw yield	22
2.8.3. Yield components	23
2.9. Effect of irrigation regime chemical on composition of wheat plants	24
2.9.1. Potassium content	24
2.9.2. Nitrogen and protein contents	24
2.9.3. Phosphorus content	25
2.10. Effect of irrigation regime on water relations	27
2.10.1. Consumptive use	27
2.10.2. Water use efficiency	28
2.11. Effect of irrigation regime on potassium use efficiency	29
2.12. Effect of potassium fertilization levels on potassium forms	30
2.12.1. Total potassium	30
2.12.2. Fixed potassium	31
2.12.3. Exchangeable potassium	31
2.12.4. Soluble potassium	32
2.13. Effect of potassium fertilization levels on wheat growth	33
2.13.1. Grain yield	33
2.13.2. Straw yield	35
2.13.3. Yield components	36
2.14. Effect of potassium fertilization levels on chemical composition of wheat plants	37
2.14.1. Potassium content	37

2.14.2. Nitrogen and protein contents	38
2.14.3. Phosphorus content	39
2.15. Effect of potassium fertilization levels on wheat relations ..	40
2.15.1. Consumptive use	40
2.15.2. Water use efficiency	41
2.16. Effect of potassium fertilization levels on potassium use efficiency	42

3. MATERIALS AND METHODS :

3.1. Loyout of the experiment	44
3.2. Location of collected soil samples (first experiment)	44
3.3. Soil analyses	44
3.4. Potassium forms	47
3.5. The green house experiment (second experiment)	48
3.6. Soil water relationship	50
3.7. Growth pamerters of plant	52
3.8. Plants analysis	52
3.9. Some paramerters measured at harvest stage	53
3.10. Some water relations	53
3.11. Statistical analysis	54

4. RESULTS AND DISCUSSION:

4.1. Relationship between selected sandy soils pretties and their content of different forms of potassium	55
4.1.1. The studied soil properties	55
4.1.2. Potassium forms	55
4.1.2.1. Soluble potassium	55
4.1.2.2. Exchangeable potassium	57
4.1.2.3. Available potassium	60

4.1.2.4. Fixed potassium	60
4.1.2.5. Total potassium	62
4.2. Dry weight of wheat stems and roots at 60 and 110 days age	63
4.3. Yield and yield components	72
4.3.1. Yield and straw yield	72
4.3.2. Yield components	78
4.4. NPK content of wheat plants	84
4.4.1. Nitrogen content	84
4.4.2. Phosphors content	101
4.4.3. potassium content	118
4.5. Some paramerters measured at harvest stage	134
4.5.1. Potassium use efficiency	134
4.5.2. Protein content	136
4.6. Some water relations	139
4.6.1. Consumptive use	139
4.6.2. Water use efficiency	141
4.7. Potassium forms in the soil after harvest	143
4.7.1. Soluble potassium	143
4.5.2. Exchangeable potassium	144
4.7.3. Fixed potassium	146
4.5.2. Total potassium	147
4.8. Evaluation of some extractants for available potassium extractants	149
5. SUMMARY	154
6. REFERENCES	165
APPANOIX	
ARABIC SUMMARY	

INTRODUCTION

INTRODUCTION

The area of Egypt is 1.0 million km². Sandy soils occupy most of Egypt's area. Sandy soil is recognized by poor water retention, low soil fertility, nutrient deficiency and the low contents of organic matter and clay minerals. The poor preserving water and nutrients in these soils is very common and could be the main constraints for agriculture production in these soils. These soils require considerable applications of inorganic and organic fertilizers. On the other hand, the distribution pattern of individual exchangeable cation in the sandy soil was arranged in the descending order of $\text{Ca} > \text{Na} > \text{mg} > \text{K}$ (Abdel-Aziz, 2005).

Cultivation of cereals on sandy soils is considered suitable from the stand point of agronomic importance and a considerable proportion of cereals is grown on sandy soil. (Webb *et al.*, 1997).

Wheat is the most important grain crop all over the world. In Egypt, it is the main winter cereal crop. The total area in Egypt cultivated by wheat is about 2.3 million feddan producing total annual yield of about five million tons. However, there is still a gap between production and consumption of wheat. Wheat provides more nourishment for the people of the world than any other food source. Bread is the principal food made from wheat. Bread has been a basic food throughout the recorded history of civilized man. Therefore, the addition of more land becomes necessary to cover up the shortage in