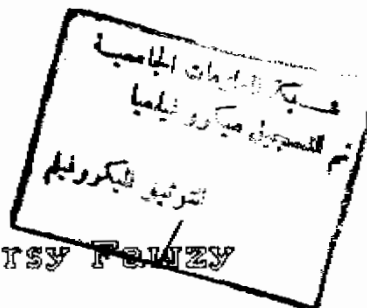


**Effect of Some Amendments on
Soil Properties and Plant Growth**

By

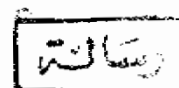
Khaled sayed Moursy Farzy



**A thesis submitted in partial
fulfillment**

of

**the requirements for the degree of
Master of Science**



In

Agricultural Science

(Soil Science)

49801

631.43

K.S

Department of Soil Science

Faculty of Agriculture

Ain Shams University

1993



APPROVAL SHEET

Effect of Some Amendments on Soil Properties and Plant Growth

By

Khaled Sayed Moursy Fawzy

B.Sc. Agric. (Soil Sci.) Fac. Agric.,

Cairo University, 1982.

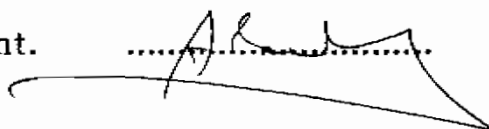
This thesis for M. Sc. degree has been approved by:

Prof. Dr. Adel E. El-leboudi

Professor & Head of Soils Department.

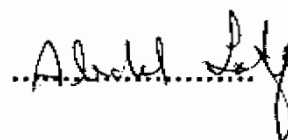
Faculty of Agriculture.

Ain Shams University

.....

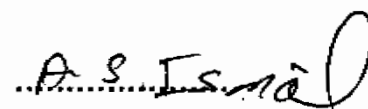
Prof. Dr. Ibrahim Atia Abdel Latif

Professor Soil Sci. National Research Centre

.....

Prof. Dr. Abdel-Samad S-Ismail

Professor Soil Sci., Ain Shams Univ.

.....

Date of examination : 20/3/1993



Effect of Some Amendments on Soil Properties and Plant Growth

By

Khaled Sayed Moursy Fawzy
B.Sc. Agric. (Soil Science),
Fac. Agric, Cairo Univ., 1982

Under the supervision of:

Prof. Dr. A.S. Ismail
Prof. of Soil Sci., Fac. Agric.,

Prof Dr. S.A. Ibrahim
Prof of Soil Sci., National Research Centre

Dr. Sh.M. Gawish,
Ass. Prof. of Soil Sci., Fac. Agric.

ABSTRACT

Two pot experiments were carried out by application of 2% or 4% of Chicken manure and humefied peanut shells either alone or in combination with 0.2% polyacrylamide gel to sandy soil. The first experiment was carried out to study the effect of these organic amendments on the physical and chemical properties of the fallow sandy soil or under its cultivation by cucumber. Soil and plant samples were analysed after one,

two and three months of plant growth. Results indicate that polyacrylamide gel improved infiltration rate and aggregates of the sandy soil while the two rates of chicken manures were superior to increase nutrient availability in soil and cucumber dry matter yield as well as uptake of macro-and micronutrients. The second experiment was carried to investigate the residual effect of these organic amendments on the chemical properties of soil and cucumber growth in the next season. Results indicate that chicken manure was still superior to the other treatments.

On the other hand, other pot experiment was carried out to study the effect of sulfur, peanut shell and chicken manure on physical and chemical properties of a calcareous soil as well as the cucumber growth. Results indicate that application of these amendments did not improve the physical properties, but increase nutrient availability. Cucumber plants did not grow after 25 days under the poor physical properties of the studied calcareous soil.

ACKNOWLEDGEMENT

The author wishes to express his deep gratitude and appreciation to prof. Dr. A.S. Ismail and Dr. Sh. M. Gawish, Soils Department, Faculty of Agriculture, Ain-Shams University, for suggesting the problem, supervision, continuous helping and introducing all facilities needed throughout the hole investigation and during writing the manuscript. Also, the author expres his deep thanks to Prof.Dr. S.A. Ibrahim, Soil Lab. and Water Use, National Research centre for his supervision during carrying out this study.

Thanks to prof. Dr. Ibrahim Abd El-Latif, Soil Lab. and Water Use, National Research Centre for introducing all facilities needed throughout the hole investigation period.

Thanks also, to staff members of Soil Lab. and Water Use, National Research Centre for their sincere help and providing certain needed facilities.

CONTENTS

	Page
1 - INTRODUCTION	1
2 . REVIEW OF LITERATURE.	3
2.1. Effect of organic materials on some physical, chemical properties and nutrient availability of soils.	3
2.1.1. Physical properties.	3
2.1.2. Chemical properties.	4
2.1.3. Macronutrients availability.	5
2.1.4. Micronutrients availability.	7
2.2. Effect of organic materials on plant growth and nutrients uptake.	9
2.2.1. Plant growth.	9
2.2.2. Uptake of macronutrients N.P and K.	10
2.2.3. Uptake of micronutrients Fe, Mn, Zn and Cu.	13
2.3. Effect of polyacrylamide gel on some soil properties.	14
2.4. Effect of polyacrylamide gel on plant growth.	17
2.5. Effect of sulfur on some soil properties.	18
2.6. Effect of sulfur on plant growth.	20

3 .	MATERIALS AND METHODS	23
3.1.	Soil sampling	23
3.2.	Organic residues preparation.	23
3.3.	Polyacrylamide gel-PAMG, (Evergreen 500).	25
3.4.	Elemental sulfur.	25
3.5.	Pot experiments.	25
3.6.	Uncultivated pot experiment.	28
3.7.	Analysis procedures.	28
a -	Soil analysis.	28
b -	Plant analysis.	29
c -	Organic manures analysis.	30
d -	Statistical analysis.	30
4 .	RESULTS AND DISCUSSION.	31
4.1.	First experiment.	31
4.1.1.	Effect of some natural and synthetic organic materials on physical and chemical properties as well as nutrient availability of sandy soil at different periods.	31
4.1.1.1.	Physical properties.	31
4.1.1.2.	Chemical properties	39
a -	At zero time of incorporation . .	39
b -	After 30,60 and 90 days of incorporation.	42
4.1.1.3.	Nutrient availability.	46
a -	At zero time of incroporation. . .	46

b - After 30 , 60 and 90 days of incorporation.	50
4.1.2. Effect of some natural and synthetic organic materials on chemical prop- erties and nutrient availability of sandy soil at different growth periods of cucumber plants.	54
4.1.2.1. Chemical properties.	54
4.1.2.2. Nutrient availability.	58
4.1.3. Effect of some natural and synthetic organic materials on growth and nutrient uptake by cucumber plant grown on sandy soil.	64
4.1.3.1. Dry matter	64
4.1.3.2. Nutrient uptake.	65
4.2. Second experiment.	75
4.2.1. Residual effect of some natural and synthetic organic materials on chemical properties and nutrient availability of sandy soil, at different periods.	75
4.2.1.1. Chemical properties.	75
4.2.1.2. Nutrient availability.	78

4.2.2. Residual effect of some natural and synthetic organic materials on chemical properties and nutrient availability of sandy soil at different growth periods of Cucumbe plants.	83
4.2.2.1. Chemical properties.	83
4.2.2.2. Nutrient availability.	86
4.2.3. Residual effect of some natural and synthetic organic materials on growht and nutrient uptake by cucumber plants grown on sandy soil.	90
4.2.3.1. Dry matter.	90
4.2.3.2. Nutrient uptake.	90
4.3. Third experiment	100
4.3.1. Infleunce of sulfur and organic materials on some physical and chemical properties of a non-cultivated calcareous soil at different incorporation periods.	100
4.3.1.1. Physical properties	100
4.3.1.2. Chemical properties	103
4.3.1.3. Availability of some macro-and micronutrients	106
5 - SUMMARY	111
6 - REFERENCES	118

LIST OF TABLES

Table No.		Pages
1	Mechanical analysis of the soil samples	24
2	Some Chemical Properties of the soil samples. . .	24
3	The chemical characteristics of the two decomposable organic materials under investigation.	24
4	Effect of some natural and synthetic organic materials on the size distribution of sandy soil aggregates.	32
5	Average values of infiltration rate of sandy soils as affected by application of some natural and synthetic organic materials for different periods of incorporated (ml/h)	34
6	Effect of some natural and synthetic organic materials on some chemical properties of sandy soil a-At zero time of incorporation	40
	b - After 30, 60 and 90 days of incorporation . .	43
7	Effect of some natural and synthetic organic materials on the extractable nutrients from sandy soils.	
	a - At zero time of incorporation	47
	b - After 30,60 and 90 days of incorporation (Avail-P, Exch.-K).	51
	c - After 30, 60 and 90 days of incorporation (DTPA-Fe,Mn,Zn and Cu)	52
8	Effect of some natural and synthetic organic materials on chemical properties of sandy soil at different growth periods of cucumber plants	55
9	Effect of some natural and synthetic organic materials on P and K availability of sandy soils at different growth periods of cucumber plants . .	59

10	Effect of some natural and synthetic organic materials on micronutrient availability of sandy soil at different growth periods of cucumber plants	61
11	Effect of some natural and synthetic organic materials on dry matter yield and macronutrient uptake at different growth periods of cucumber plants grown on sandy soil	66
12	Effect of some natural and synthetic organic materials on micronutrient uptake at different growth periods of cucumber plants grown on sandy soil	71
13	Residual effect of some natural and synthetic organic materials on some chemical properties of sandy soil at different periods of incorporation	76
14	Residual effect of some natural and synthetic organic materials on the available P and K of sandy soil at different periods of incorporation.	79
15	Residual effect of some natural and synthetic organic materials on DTPA extractable micronutrients of sandy soil at different periods of incorporation.	82
16	Residual effect of some natural and synthetic organic materials on some chemical properties of sandy soil at different growth periods of cucumber plants.	84
17	Residual effect of some natural and synthetic organic materials on the available P and K of sandy soil at different growth periods of cucumber plants.	87
18	Residual effect of some natural and synthetic organic materials on DTPA extractable micronutrients of sandy soil at different growth periods of cucumber plants.	88

19	Residual effect of some natural and synthetic organic materials on dry matter yield and macronutrient by cucumber plants grown on sandy soil	91
20	Residual effect of some natural and synthetic organic materials on micronutrient uptake by cucumber plants grown on sandy soil.	96
21	Effect of sulfur and organic materials on infiltration rate of the calcareous soil after 30 days of incorporation (ml/h.).	101
22	Effect of sulfur and organic materials on some chemical properties of the calcareous soil at different periods of incorporation.	104
23.	Effect of sulfur and organic materials on nutrient availability of the calcareous soil at different periods of incorporation	107

LIST OF FIGURES

Fig. No.		Pages
1	Effect of the interactions of some natural and synthetic organic materials on infiltration rate of sandy soil after 30 days of incorporation	35
2	Effect of the interactions of some natural and synthetic organic materials on infiltration rate of sandy soil after 60 days of incorporation	36
3	Effect of the interactions of some natural and synthetic organic materials on infiltration rate of sandy soil after 90 days of incorporation	37
4	The regression equations between available P and K in soil and their uptake by cucumber plants at different growth periods (1 st experiment).	69
5	The regression equations between available Fe and Mn in soil and their uptake by cucumber plants at different growth periods (1 st experiment).	73
6	The regression equations between available Zn and Cu in soil and their uptake by cucumber plants at different growth periods (1 st experiment).	74
7	The regression equations between available P and K in soil and their uptake by cucumber plants at different growth periods (2 nd experiment)	94
8	The regression equations between available Fe and Mn in soil and their uptake by cucumber plants at different growth periods (2 nd experiment)	98
9	The regression equations between available Zn and Cu in soil and their uptake by cucumber plants at different growth periods (2 nd experiment)	99
10	Effect of sulfur and organic materials on infiltration rate of the calcarous soil after 30 days of incorporation. (1 st experiment)	102

INTRODUCTION