بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

IMPROVEMENT OF SOIL STRUCTURE IN SOME SOILS OF EGYPT

BY

Sobhi Fahmi Mansour

B.Sc. (Soil Science), Cairo University (1981)
M.Sc. (Soil Science), Cairo University (1996)

Thesis

Submitted in Partial Fulfillment

of

the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

(Soil Science)

Department of Soil Science

Faculty of Agriculture

Cairo University

2002

٦٢٩

APPROVAL SHEET

IMPROVEMENT OF SOIL STRUCTURE IN SOME SOILS OF EGYPT

BY

Sobhi Fahmi Mansour

B.Sc. (Soil Science), Cairo University (1981)
M.Sc. (Soil Science), Cairo University (1996)

This Thesis for Ph.D. degree has been approved by:

Prof. Dr. Salah el Din .....

Prof. Dr. .....

Prof. Dr. Essam Shawky .....

Date of Examination: 29 / 5 / 2002

Name of Candidate : Sobhi Fahmi Mansour **Degree**: Ph.D.

Title of thesis: Improvement of soil structure in some soils of Egypt

Supervisors: Prof. Dr. M.F. Kandil Prof. Dr. S.B. El-Amir
Prof. Dr. M.M. Selem

Department: Soil Science

Branch: Soil Physics **Approval**: 29 / 5 / 2002

ABSTRACT

The theme of this study was to detect the improvement of soil structure as well as the yield of two crops (wheat and maize) by filter mud or sugar lime individually. To achieve the objectives, two field experiments were carried out for four seasons at El-Ismailia Experimental Station where the texture class is sandy, and at El-Gemiza Experimental Station where the texture class is clay. A complete randomized block design with four treatments (0.0, 2.1, 4.2 and 8.4 ton/fed.) and three replicates were used.

The obtained results revealed that adding any of filter mud or sugar lime to the soils increased total porosity, water holding pores, total aggregates, available water and the electrical conductivity. On the other hand, soil bulk density was decreased with increasing application rate in the sandy and clay soils. Moreover, hydraulic conductivity and quickly drainable pores were decreased while the fine capillary pores and penetration resistance were increased in the sandy soil. In clay soil the opposite trend was found. Furthermore, the pH value was decreased in the two soils when filter mud was used, but the opposite trend was found when sugar lime was added.

Application of any of filter mud or sugar lime to clay soil increased total aggregate and large aggregate on the expense of small aggregate size. In the sandy soil it caused an increase in total aggregate and mean weight diameter (MWD).

As a result of improving soil physical condition the grain yield of both Wheat and Maize were increased especially at 8.4 ton/fed. of filter mud or 2.1 ton/fed. of sugar lime.

ACKNOWLEDGMENT

The author wishe's to express his deepest appreciation and sincerest gratitude to Deceased **Prof. Dr. M. Fakhry Kandil.** Head of Soil Department who suggested the theme of this work and **Prof. Dr. Salah El-Din Bakr El-Amir,** professor of Soil Physics, Soil Department, Faculty of Agriculture, Cairo University for his kindness, his continuous guidance and fruitful efforts to supervise this work. Grateful thanks are due to **Prof. Dr. Mahmoud M. Selem**, Head of Soil Physics and Chemistry Department, Soil, Water & Environ. Res. Inst., ARC, Ministry of Agriculture for his sincere supervision and assistant throughout this work.

A great appreciation is expressed to every one in Soils, Water and Environment Research Institute, ARC, Ministry of Agriculture for their help through out this work.

CONTENTS

	Page
1- INTRODUCTION	1
2- REVIEW OF LITERATURE	3
2.1. Filter mud	3
2.2. Sugar lime	3
2.3. Rate of application and durability of the sugar refinery industry on physical properties and yield	4
2.3.1. Effect of application rate	4
2.3.2. Duration of its effect	6
2.4. Soil physical properties affected by industrial wastes	7
2.4.1. Soil texture	7
2.4.2. Soil aggregation and soil structure	8
2.4.3. Bulk density and total porosity	10
2.4.4. Pore size distribution	12
2.4.5. Soil penetration resistance (Compaction)	12
2.4.6. Hydraulic conductivity	15
2.4.7. Moisture regime retention curve	17
2.4.8. Biological activity	18
2.5. Soil chemical properties effect by industrial wastes	20
2.5.1. Organic mater	20
2.5.2. Soil salinity and soil pH	22
3- MATERIALS AND METHODS	24
3.1. Natural of industrial wastes	29
a- Filter mud (F.M)	29
b- Sugar lime (S.L)	29

Page

3.2. Soil sampling and preparation 29

3.2.1. Physical analysis 32

3.2.2. Chemical analysis 34

4- RESULTS AND DISCUSSION 35

4.1. Effect of filter mud and sugar lime on some physical and chemical properties 35

4.1.1. Physical properties 35

4.1.1.1. Aggregation and aggregate stability 35

4.1.1.2. Soil moisture retention 45

4.1.1.3. Total porosity and pore size distribution 61

4.1.1.4. Bulk density 77

4.1.1.5. Hydraulic conductivity 85

4.1.1.6. Penetration resistance (compaction).....

4.1.2. Chemical properties 101

4.1.2.1. Organic matter and polysaccharides 101

4.1.2.2. Soil salinity (Electrical conductivity) 105

4.1.2.3. Soil reaction (pH) 110

4.2. Effect of filter mud and sugar lime on wheat and Maize yield 110

5- SUMMARY and CONCLUSION 117

6- REFERENCES 121

ARABIC SUMMARY

1- Introduction

1- INTRODUCTION

Soil structure refers to the arrangement of flocculated and cemented soil solids as a consequence of the natural processes of soil development and modified by the field management practices of man to meet his needs. Soil structure is a result of the interactions mainly between inorganic soil colloids such as clay minerals or sesquioxidehyrates, polyvalent cations, and fractions of soil organic matter.

The structure of soil is important in determining its productivity . Consequently, good soil structure permits plant growth factors to function optimum efficiency due to improvement of soil fertility and water holding capacity (Morsy et al 1982). Organic matter being without doubt the most important factor in forming good soil structure.

The soils in Egypt are very poor in their organic matter content which fluctuates between 0.1-1% due to the climatic arid conditions and high decomposition rate of organic matter. Furthermore in Egypt as many other countries there are tremendous amount of industrial byproducts resulting from sugar industry such as filter mud. This amount could reach about 400-500 x 10^3 ton/per year. These materials were thrown in the Nile river causing environmental pollution. Sugar lime (S.L) produced from sugar beet factories reaches about 2.5 x 10^6 ton per year as byproduct obtained from the sugar industries which are increasing

year after year without using. Such by products could have an economical value as a soil conditioner .

In this study, land application of these two industrial by products is viewed from two perspective: as a nonpolluting waste disposal method and as a soil amendment.

Therefore, the aim of this work was to find out the potential use of these materials and its effects on physical and chemical properties which affect the soil structure and subsequently improve soil productivity.

2- Review Of Literature