IMPACT OF USE OF TREATED WASTEWATER ON SOME ECO-AGRICULTURAL CHARACTERISTICS IN BAHR EL–BAKAR AREA

BY

SADEAKA ABD EL-WAHED AHMED

B. Sc. Agric. Sc. (Soil Science), Ain Shams University, ٢٠٠٠

A thesis submitted in partial fulfillment

of

the requirements for the degree of

MASTER OF SCIENCE

In

Agricultural Science
(Soil Science)

Department of Soil Science
Faculty of Agriculture
Ain Shams University

٢٠٠٧

APPROVAL SHEET

IMPACT OF USE OF TREATED WASTEWATER ON SOME ECO-AGRICULTURAL CHARACTERISTICS IN BAHR EL–BAKAR AREA

BY

SADEAKA ABD EL-WAHED AHMED

B. Sc. Agric. Sc. (Soil Science), Ain Shams University, ٢٠٠٠

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

Prof. Dr. Refaat A. Khalil ……..
Prof. of Soil Sc., Fac. of Agric., El-Menofya Univ.

Prof. Dr. Abdelmonem M. Elgala ……..
Prof. Emeritus of Soil Sc., Fac. of Agric., Ain Shams Univ.

Dr. Mahmoud M.A. Elbordiny ……..
Associate Prof. of Soil Sc., Fac. of Agric., Ain Shams Univ.

Dr. Mohamed A. O. Elsharawy ……..
Associate Prof. of Soil Sc., Fac. of Agric., Ain Shams Univ

Date of Examination: ١٩/ ٣ / ٢٠٠٧

IMPACT OF USE OF TREATED WASTEWATER ON SOME ECO-AGRICULTURAL CHARACTERISTICS IN BAHR EL–BAKAR AREA

BY

SADEAKA ABD EL-WAHED AHMED

B. Sc. Agric. Sc. (Soil Science), Ain Shams University, ٢٠٠٠

Under the supervision of:

Dr. Mohamed Ali Osman Elsharawy

Associate Prof. of Soil Sc., Dept. of Soil Sc., Fac. of Agric., Ain Shams Univ.

Dr. Mahmoud Mohamed Elbordiny

Associate Prof. of Soil Sc., Dept. of Soil Sc., Fac. of Agric., Ain Shams Univ.

Prof. Dr. Tarik Abdel-Rahman Tawfic

Prof. of Soil Sc., Central Lab., Environ., Qual., Monitoring, National Water Res., Center.

أثر إستخدام ميل الصرف المعالجة على بعض خصائص البيئة الزراعية في منطقة بحر البقر

رسالة مقدمة من

صديقة عبد الواحد أحمد
بكالوريوس في علوم زراعية (أراضي), جامعة عين شمس, ٢٠٠٠

للحصول على

درجة الماجستير في العلوم الزراعية
(أراضي)

كليه الزراعة - جامعه عين شمس

قسم الأراضي

٢٠٠٧

صفحة الموافقة على الرسالة

أثر إستخدام مياه الصرف المعالجة على بعض خصائص البيئة الزراعية في منطقة بحر البقر

رسالة مقدمة من

صديقة عبد الواحد أحمد
بكالوريوس في علوم زراعية (أراضي), جامعة عين شمس, ٢٠٠٠

للحصول على

درجة الماجستير في العلوم الزراعية
(أراضي)

ا.د. رفعت أحمد خليل.....
أستاذ الأراضي, كلية الزراعة , جامعة المنوفية

ا.د. عبد المنعم محمد الجلا.....
أستاذ الأراضي المتفرغ , كلية الزراعة , جامعة عين شمس

د. محمود محمد أحمد البردينى.....
أستاذ الأراضي المساعد ، كلية الزراعة , جامعة عين شمس

د. محمد على عثمان الشعراوى .....
أستاذ الأراضي المساعد ، كلية الزراعة , جامعة عين شمس

تاريخ المناقشة ١٩ / ٣ / ٢٠٠٧

جامعه عين شمس

كليه الزراعة

رسالة ماجستير

اسم الطالبة : صديقة عبد الواحد أحمد

عنوان الرسالة : أثر إستخدام مياه الصرف المعالجة على بعض خصائص البيئة الزراعية في بحر البقر

الدرجة : ماجستير فى العلوم الزراعية (أراضي)

لجنة الإشراف

د. محمد علي عثمان الشعراوي
أستاذ الأراضي المساعد، قسم الأراضي، كلية الزراعة، جامعة عين شمس

د. محمود محمد أحمد البرديني
أستاذ الأراضي المساعد ، قسم الأراضي، كلية الزراعة، جامعة عين شمس

ا.د. طارق عبد الرحمن توفيق
أستاذ باحث، المعامل المركزية للرصد البيئي ، المركز القومي لبحوث المياه

تاريخ البحث: ٢٠٠٢/٢/١٣

الدراسات العليا

ختم الإجازة **أجيزت الرسالة بتاريخ**
١٩ / ٣ /٢٠٠٧

موافقة مجلس الكلية **موافقة مجلس الجامعة**
/ /٢٠٠٧ / /٢٠٠٧

ABSTRACT

Sadeaka Abd El-Wahed Ahmed. Impact of use of treated wastewater on some eco-agricultural characteristics in Bahr El-Bakar area. Unpublished Master of Science Dissertation, University of Ain Shams, Faculty of Agriculture, Department of Soil Science, ٢٠٠٧.

The aim of this study was to assess and evaluate water quality of Bahr El-Bakar drain and Nile water from Bahr Muis canal as a control which are reused for irrigation of some soils of Bahr El-Bakar area in Sharkia Governorate and their effect on soil characteristics and growing crops. Moreover, studies to improve some soil characteristics through equilibration pot experiment by applying certain usual amendments i.e., gypsum and compost as well as unusual ones i.e., byproduct-١ and byproduct-٢ (waste products from Citric Company) to the tested soil. A field experiment was conducted to study the effect of above treatments i.e., byproduct-١ and (١/٢ byproduct-١+ ١/٢ byproduct-٢) on some soil characteristics as well as yield and elemental composition of wheat plants.

The results show that water of Bahr El-Bakar drain could be classified as (causes severe problem), EC_w >٢ $dS.m^{-١}$ and no alkalinity hazard, SAR<١٠, while waters of Bahr Muis canal was classified as (causes no salinity problem and no alkalinity hazard). The Cu, Co and Ni concentration exceeded the permissible limits in Bahr El-Bakar drain. While, Fe, Mn, Zn and Pb concentrations in all waters were below the permissible limits.

Soil irrigated with wastewater contained relatively lower organic matter and total calcium carbonate contents compared with soil irrigated with fresh water. A little differences were found between the tow soil samples in the clay content and soil moisture constants. Whereas, the higher values of hydraulic conductivity were in the soil irrigated with fresh water compared with that irrigated with wastewater. The pH values of the two soils were below ٨,٥ with slight increase for soil irrigated with wastewater over that irrigated with fresh water. The EC_e values of soil irrigated with wastewater was ٧.٦٦ and ٥.٥٨ fold that of soil irrigated with the fresh water in the surface

and subsurface layers, respectively. The values of SAR increased in surface and subsurface layers by ٣٠.٥ and ١٦.٢ fold in the soil irrigated with wastewater compared to that of soil irrigated with fresh water, respectively. The ESP values of soil irrigated with wastewater were ٢.٢٤ and ٢.٠٥ fold that of soil irrigated with fresh water in the surface and subsurface layers, respectively .The soil irrigated with wastewater contained Cu and Ni within the permissible limits. Irrigation of wastewater significantly decreased macronutrients compared to irrigation with fresh water in cotton and wheat plants prior to flowering. The highest values of heavy metals content were found in plants grown on soil irrigated with wastewater. Although, the levels of different heavy metals were generally within the normal range.

The physical properties including bulk density and soil moisture constant as well as the chemical properties including pH, EC_e, SAR and ESP were improved by application of each amendments. Byproduct-١ as well as (١/٢ byproduct-١compiend with ١/٢ byproduct-٢) proved to be effective more than other amendments. The (١/٢byproduct-١combiend with ١/٢byproduct-٢) proved to be significantly more effective than byproduct-١ treatment.

The grain yield of wheat was increased due to byproduct-١ or (١/٢ byproduct-١compiend with ١/٢ byproduct-٢) addition to the soil compared with the control. The higher effect is obtained with (١/٢byproduct-١+ ١/٢byproduct-٢) treatment. Concentration of macro and micronutrients in leaves and grains of wheat plants increased due to treating soil with the two byproducts, byproduct-١or (١/٢ byproduct-١compiend with ١/٢ byproduct-٢). Most of those increases were significant, particularly in case of (١/٢ byproduct-١compiend with ١/٢ byproduct-٢)) treatment.

Key words: Wastewater - Soil physical characteristics - Soil chemical characteristics - Improvement - Salt affected soil - Industrial byproducts - Nutrients availability - Wheat plants.

ACKNOWLEDGMENT

The author wishes to express his deepest and gratitude to ***Dr. M. A. O. Elsharawy*** and ***Dr. M. M. A. Elbordiny*** Associate Professors of soil chemistry, Soil Dept., Fac. of Agric., Ain Shams Univ., for supervision, modification of the experimental work, valuable advice, generous assistance and writing the manuscript.

Special gratitude to **Prof. Dr. *A. S. El-Sebaey***, Prof. of soil chemistry, Soil Dept., Fac. of Agric., Ain Shams Univ. for suggesting the title and the pre supervision on this study.

Grateful thanks also, due to ***Dr. T. A. Tawfic***, Professor of chemistry and Director of Central Laboratory for Environmental Quality Monitoring (CLEQM).

Special thanks are expressed to all staff member of research staff of the Central Laboratory for Environmental Quality Monitoring (**CLEQM**) and National water Research Center for their help and providing facilities.

I am sincerely grateful thanks and indebted are due to my mother, father, sisters, brothers and my friends for their help and kind feeling.

CONTENTS

Table No. **LIST OF TABLES** **Page**

Figure No. **LIST OF FIGURES** Page