FUNCTIONAL TOXICOGENOMIC ANALYSIS FOR THE DETECTION OF GENOTOXICITY OF SOME ENVIRONMENTAL POLUTIONS

By

HEBA HASSAN HASSAN SALAH El-DIN

B.Sc. Agric. Sc.(Genetics), Ain Shamus Univ.,(2010)

A Thesis Submitted in Partial Fulfillment

Of

The Requirement for the Degree of

MASTER OF SCIENCE

in

Agricultural Sciences

(Genetics)

Department of Genetic
Faculty of Agriculture
Ain Shams University

2017

تحليلات سمية جينومية لتحديد السمية الوراثية لبعض الملوثات البيئية

رسالة مقدمة من

هبه حسن حسن صلاح الدين
بكالوريوس العلوم الزراعية (الوراثة) 2010

للحصول على
ماجستير فى العلوم الزراعية
(الوراثة)

قسم الوراثة

كلية الزراعة

جامعة عين شمس

2017

FUNCTIONAL TOXICOGENOMIC ANALYSIS FOR THE DETECTION OF GENOTOXICITY OF SOME ENVIRONMENTAL POLUTIONS

By

HEBA HASSAN HASSAN SALAH EL_DIN

B.Sc. Agric. Sc. (Genetics), Ain Shamus Univ. (2010)

Under the Supervision of:

Dr. Fatthy Mohamed Abdel-Tawab

Prof. Emeritus of Genetics, Department of Genetics, Faculty of Agriculture, Ain Shams University (Principal Supervisor)

Dr. Alia Ahmed El Seoudy

Prof. Emeritus of Genetics, Department of Genetics, Faculty of Agriculture, Ain Shams University.

Dr. Khaled Ibn El-Walid Fahmy

Prof. of Genetics, Department of Genetics, Faculty of Agriculture, Ain Shams University.

جامعة عين شمس
كلية زراعة

رسالة ماجستير

اسم الطالب : هبه حسن حسن صلاح الدين
عنوان الرسالة : تحليلات سمية جينومية لتحديد السمية الوراثية لبعض الملوثات البيئية
اسم الدرجة : ماجستير العلوم الزراعية (الوراثة)

لجنة الاشراف

د. فتحى محمد عبد التواب
استاذ الوراثة المتفرغ قسم الوراثة، كلية الزراعة، جامعة عين شمس (المشرف الرئيسى)

د. عليه احمد السعودى
استاذ الوراثة المتفرغ، قسم الوراثة، كلية الزراعة، جامعة عين شمس

د. خالد بن الوليد فهمى
استاذ الوراثة، قسم الوراثة، كلية الزراعة، جامعة عين شمس

تاريخ التسجيل
الدراسات العليا

ختم الإجازة **أجيزت الرسالة بتاريخ**

/ / 2017

موافقة مجلس الكلية **موافقة مجلس الجامعة**

/ / 2017 **/ / 2017**

Approval Sheet

FUNCTIONAL TOXICOGENOMIC ANALYSIS FOR THE DETECTION OF GENOTOXICITY OF SOME ENVIRONMENTAL POLUTIONS

By

HEBA HASSAN HASSAN SALAH EL-DIN

B. Sc. Agri. Sc., (Genetics), Ain Shams University, 2010

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

Dr. Mamdouh Kamel Amin **……**
Prof. Emeritus of Genetics, Faculty of Agriculture, Zagazig university

Dr. Eman Mahmoud Fahmy **……**
Prof. Emeritus of Genetics, Faculty of Agriculture, Ain Shams University

Dr. Alia Ahmed El Seoudy **……**
Prof. Emeritus of Genetics, Faculty of Agriculture, Ain Shams University.

Dr. Fatthy Mohamed Abdel-Tawab **……**
Prof. Emeritus of Genetics, Faculty of Agriculture, Ain Shams University

Date of Examination: 7 / 2 / 2017

صفحة الموافقة على الرسالة

تحليلات سمية جينومية لتحديد السمية الوراثية لبعض الملوثات البيئية

رسالة مقدمة من

هبه حسن حسن صلاح الدين
بكالوريوس العلوم الزراعية (الوراثة)، جامعة عين شمس، 2010

للحصول على
درجة الماجستير في العلوم الزراعية
(الوراثة)

و قد تم مناقشة الرسالة و الموافقة عليها

اللجنة

د. ممدوح كامل أمين .....
أستاذ الوراثة المتفرغ، كلية الزراعة، جامعة زقازيق

د. إيمان محمود فهمي .....
أستاذ الوراثة المتفرغ، كلية الزراعة، جامعة عين شمس

د. عليه أحمد السعودي .....
أستاذ الوراثة المتفرغ، كلية الزراعة، جامعة عين شمس

د. فتحي محمد عبد التواب .....
أستاذ الوراثة المتفرغ، كلية الزراعة، جامعة عين شمس

تاريخ المناقشة: 7 / 2 / 2017

ABSTRACT

Heba Hassan Hassan Salah El-Din: Functional toxicogenomic analysis for the detection of genotoxicity of some environmental polutions, Unpublished Master Thesis, Department of Genetics, Faculty of Agriculture, Ain Shams University, 2017.

Many chemicals compounds are added to foods and beverages to extend storage half - life or to enhance color, flavor, and texture. Food additives must be cleared by the US Food and Drug Administration (FDA) before being released into the food supply chains , and thorough testing is done on laboratory animals to determine any effects on cancer as part of this process. Sodium benzoate and Butylted Hydroxyanisole (BHA) are common additives which are usually present in very small quantities in food, and some are nutrients that may have beneficial effects. *Saccharomyces cerevisiae* is useful model for testing recommended concentrations (0.1 % for sodium benzoate and 0.02% for BHA) of food additives because of its partial homologous with human genome that reachs up to 46% and could, therefore, confer the expression of genes related to human cancer cells. A set of yeast knockout (YKO) strains representing a wide range of deleted genes were subjected to different concentrations of each of the two additives. After treatment, YKO strains and growth rate evaluated, treated human colon cancer cell line with the same concentration of both sodium benzoate and BHA and estimated the growth of those cell b via Neutral red uptaking technique. Real-time PCR is widely used for quantification of mRNA levels for gene expression of cancer-related genes in human colon cancer cells line after treated them by each of the two food additives. Comparison between data obtained from *S. cerevisiae* with those resulting from different human cancer cell lines revealed significant deletarious effects of the tested food additives on human health.

Key words:

Toxicogenomics**,** Food Additives , *Saccharomyces cerevisiae* gene knockout strains growth rates, Human cell lines , Sodium benzoate and Butylted Hydroxyanisole (BHA), Protein interaction

ACKNOWLEDGMENT

Firstly, I'd like to thank **my God Allah, the greatest and almighty** for give me the force and support during the master work.

I'd like to thank **Prof. Dr. Fatthy Mohamed Abdel-Tawab,** Professor Emeritus of Genetics, Genetics Dept., Fac. of Agric., Ain Shams University for designing a fantastic master plan which it's important for solving the recent and future of food industry problem.

I'd like to thank **Prof. Dr. Alia Ahmed El Seoudy**, Professor Emeritus of Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for her kind supervision and helping me either materially or morally.

I'd like to thank **Prof. Dr. Eman Mahmoud Fahmy**, Professor Emeritus of Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for her helping me either materially or morally.

I'd like to thank **Prof. Dr. Khaled Ibn El-Walid Fahmy**, Professor Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for his kind supervision and helping me either materially or morally.

I'd like to thank **Prof. Dr. Khaled Abdel Aziz**, Professor Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for his helping me either materially or morally.

I'd like to thank **Prof. Dr. Ahmed H. Abo_doma**, Professor Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for his helping me either materially or morally.

I'd like to thank **Prof. Dr. Ekram Salah El_Din Ahmed**, Professor Genetics, National Research Centre for her helping me either materially or morally (specially with knocked out yeast kit).

I’d like to thank **Dr. Sawsan El ateek**, Lecturer at Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for her kind supervision and helping me either materially or morally.

I’d like to thank **Dr. Nouh Aid**, Lecturer at Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for his kind supervision and helping me either materially or morally.

I’d like to thank **Dr. Mahmoud El mosallmy**, Lecturer at Genetics, Genetics Dept., Fac. Of Agric., Ain Shams University for his kind supervision and helping me either materially or morally.

I’d like to thank the group of Biochemical Genetic Laboratory specially; **Prof. Dr. Ahmed H. Abo_doma, Shereen khaled and Sara adel** for guiding and helping me.

I’d like to thank cytogenetics lab. “**Prof. Dr. El sayed Husseien", Professor Emeritus of** Genetics, Genetics Dept., Fac. of Agric., Ain Shams Univ. and special thanks to **Mona Moghazy.**

I’d like to thank the Molecular Genetics Lab **“Pro. Dr. Mohamed Abd El-Salam”**, **Professor Emeritus of** Genetics, Genetics Dept., Fac. of Agric., Ain Shams Uni. and his group; **Dr. Nouh Eid, Dr. Mahmoud Mossallamy, Hager Tarek and Hala Zoghly.**

I’d like to thank **Basel Adel Nasser and Merna Hesham** for helping me.

I cann’t express my feels to thank my parents and my brothers to enhance and encourage me.

CONTENTS

LIST OF TABLES