



جامعة عين شمس
كلية العلوم
قسم علم النبات

التأثيرات الفسيولوجية لاستيجماستيرول علي نمو وإنتاجية وبعض الأنشطة الأيضية لاثنان من المحاصيل الاقتصادية النامية تحت اجهاد الملوحة

رسالة مقدمة من

رضوان رضوان أبو العباس خليل

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المشرفون

د./حنان احمد اسماعيل هاشم

مدرس فسيولوجيا النبات
كلية العلوم – جامعة عين شمس

د./رئيفة احمد حسنين

استاذ فسيولوجيا النبات المتفرغ
كلية العلوم- جامعة عين شمس

د./دينا محسن بركه

استاذ البيئه النباتية المساعد
كلية العلوم – جامعة بنها

د./فردوس محمد بسيوني

استاذ فسيولوجيا النبات المساعد
كلية العلوم – جامعة بنها

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Ain Shams University
Faculty of Science
Botany Department

**Physiological effects of stigmasterol on growth,
productivity and certain metabolic activities of two
economic crop plants grown under salinity stress**

A Thesis

**Submitted For the Degree of Doctor of Philosophy in
Science in Botany (plant physiology)**

By

Radwan Radwan Abou El-Abbas Khalil
B.Sc. (Botany & Chemistry) –2002
M.Sc Plant Physiology – 2007

Supervised By

Prof. Dr. Raifa A. Hassanein
Professor of Plant Physiology,
Faculty of Science, Ain Shams University

Dr. Hanan A. Hashem
Lecturer of plant physiology
Faculty of Science, Ain Shams University

Dr. Fardous M. Bassuony
Assistant Professor of Plant Physiology
Faculty of Science-Benha University

Dr. Dina M. Baraka
Assistant Professor of Plant Ecology
Faculty of Science-Benha University

2011



Ain Shams University
Faculty of Science
Botany Department

Author's Name : Radwan Radwan Abou El-Abbas Khalil

Thesis title: Physiological effects of stigmasterol on growth, productivity and certain metabolic activities of two economic crop plants grown under salinity stress

Degree : Doctor of philosophy in Science - Botany (Plant Physiology).

Supervisors

Prof. Dr. Raifa A. Hassanein, Professor of Plant Physiology, Faculty of Science, Ain Shams University.

Dr. Fardous M. Bassuony, Assistant Professor of Plant Physiology, Faculty of Science, Benha University.

Dr. Hanan A. Hashem, Lecturer of plant physiology, Faculty of Science, Ain Shams University.

Dr. Dina M. Baraka, Assistant Professor of Plant Ecology, Faculty of Science, Benha University.

Head of Botany Department

Prof. Dr. Amira A. Hassanein



Ain Shams University
Faculty of Science
Botany Department

Approval sheet

Title of Thesis:

Physiological effects of stigmasterol on growth, productivity and certain metabolic activities of two economic crop plants grown under salinity stress

Degree: Doctor of philosophy in Science - Botany (Plant Physiology)

Author's Name: Radwan Radwan Abou El-Abbas Khalil

This Thesis for the Ph.D Degree has been approved by:

Name	Position	Signature
Prof. Dr.		
Prof. Dr.		
Prof. Dr.		
Prof. Dr.		

(Committee in charge)

Date: / / 2011

This work is dedicated

 *To The Memory of*

My Late Father

 *To My Mother*

 *To My Sister and*

My Brothers

 *TO MY Lovely wife and Sweet*

Daughter

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جامعة عين شمس
كلية العلوم
قسم علم النبات

اسم الباحث : رضوان رضوان ابو العباس خليل

عنوان الرسالة :

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الدرجة : دكتوراه الفلسفه فى العلوم - النبات (فسيولوجيا النبات)

المشرفون

الاسم	الوظيفة	التوقيع
ا.د/رنيفه احمد حسنين	استاذ فسيولوجيا النبات المتفرغ- كلية العلوم - جامعة عين شمس	
د/ فردوس محمد بسيونى	استاذ فسيولوجيا النبات المساعد- كلية العلوم- جامعة بنها	
د/ حنان احمد هاشم	مدرس فسيولوجيا النبات- كلية العلوم - جامعة عين شمس	
د/ دينا محسن بركه	استاذ البيئه النباتيه المساعد- كلية العلوم- جامعة بنها	

رئيس قسم النبات

ا.د/ أميره احمد حسنين



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الدرجة : دكتوراه الفلسفه فى العلوم - النبات (فسيولوجيا النبات)

لجنة الحكم والمناقشة

الاسم	الوظيفة	التوقيع
أ.د/		
أ.د/		
أ.د/		
أ.د/		

رئيس قسم النبات

أ.د/ أميره احمد حسنين

*This thesis has not been previously
submitted for any degree at this
or at any other university*

Signature

Radwan Radwan Abou El-Abbas Khalil

شكر وتقدير

الحمد لله رب العالمين من قبل ومن بعد

كل الشكر والتقدير والاحترام الى استاذتى الدكتورة رثيفة أحمد حسنين، استاذ فسيولوجيا النبات بكلية العلوم جامعة عين شمس على جهدها الكبير فى اقتراح نقطة البحث ومراجعتها للرسالة وتشجيعها لى اثناء هذا العمل لاجراجه فى صورة مكتمله.

أيضا كل الشكر والتقدير الى الدكتورة فردوس محمد بسيونى، أستاذ فسيولوجيا النبات المساعد بكلية العلوم جامعة بنها لقراءة ومراجعة هذا العمل وتدعيمها لى اثناء هذه الدراسة.

ايضا عميق شكرى وتقديرى للدكتورة حنان احمد هاشم، مدرس فسيولوجيا النبات بكلية العلوم جامعة عين شمس لاعطائى الكثير من وقتها لمراجعة هذا العمل واخراجها فى صورة نهائيه.

ايضا اشكر الدكتورة دينا محسن بركه، استاذ مساعد البيئة النباتيه بكاية العلوم جامعة بنها على تشجيعها لى اثناء هذا العمل.

وكل الشكر والتقدير للدكتورة اميرة أحمد حسنين ، رئيس قسم النبات وكل اعضاء هيئة التدريس بقسم النبات كلية العلوم جامعة عين شمس لتشجيعهم لى اثناء هذا العمل. وأيضا رئيس وأعضاء هيئة التدريس بقسم النبات كلية العلوم جامعة بنها لتدعيمهم لى اثناء هذه الدراسة.

وأخيرا وليس اخرا عميق شكرى وتقديرى لاسرتى الكريمه على تشجيعها وتوفير الوقت اللازم لى لانهاه هذه الدراسة.

رضوان رضوان أبو العباس خليل

Abstract

Name: Radwan Radwan Abou El-Abbas Khalil

Title: Physiological effects of stigmasterol on growth, productivity and certain metabolic activities of two economic crop plants grown under salinity stress.

Degree: Doctor of Philosophy in Science (Botany, plant physiology).

Submitted to: Botany department, Faculty of Science, Ain Shams University.

Few years of stigmasterol research brought into light several vital functions of this new group of phytohormone in plant growth and development. New discoveries of the physiological properties of stigmasterol allow us to consider them as highly promising, environment-friendly natural substances suitable for wide application in plant protection and yield promotion in agriculture. In the present work, we studied the effect of applying stigmasterol (200 ppm) to seed on alleviating the harmful effects of salt stress (using 0.0, 100, 150 and 200 mM NaCl) on growth characteristics, endogenous phytohormones, photosynthetic pigments, carbohydrate contents, nitrogen contents, proline, total phenol, activity of phenylalanine ammonia lyase (PAL), protein banding patterns, antioxidant enzymes activities, reduced glutathione, malondialdehyde contents and the mineral ion contents of two economically important plants; *Linum usitatissimum* L. (Flax) (Sakha 2) and *Vicia faba* L. (Faba bean) (Sakha 1). In addition yield and yield attributes (number of capsules or pods per plant, number of seeds per capsules or pods, number of seeds per plant, dry weight of each capsule or pod, seed index, weight of yielded seeds per plant, quality and composition of fibers (in flax) as well as the biochemical aspects of the yielded seeds (oil contents and fatty acids composition in flax and carbohydrate contents, total protein, protein banding patterns and mineral ions content in faba bean) were also determined. The obtained results proved

that stigmasterol is a phytohormone with pleiotropic effect, it has a promotive effect on growth parameters, biochemical activities and all the yield characteristics under normal condition of growth in both flax and faba bean plants. Moreover, stigmasterol could improve the nutritional value and the economic importance of the studied plants by improving fiber quality of flax and increasing linolenic acid (omega 3) and oleic acid (omega 9) contents of seed oil of flax and total protein and carbohydrates contents of faba bean seeds. Stigmasterol also helped both plants to overcome stress provoked by NaCl as we reported that seed soaking in stigmasterol gives plants some halophytic characteristics which enable the plants to partially alleviate the drastic effects of all the used concentrations of NaCl.

Key words: Flax, faba bean, salt stress, stigmasterol, growth, phytohormons, phenylalanine ammonia lyase (PAL), antioxidant enzymes, fiber, Fatty acids, proline, phenols, SDS-PAGE, carbohydrates, yield

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