

ACKNOWLEDGEMENT

First of all, I would like to express my deepest thanks to "**ALLAH**" who gave me the power, knowledge and helping me to carry out and finish this work.

I wish to express my sincere appreciation and gratitude to **Prof. Dr. Tahany Hathout**, Professor of Plant Physiology, Botany Department, Faculty of Women for Arts, Science and Education, Ain Shams University for her unlimited and devoted efforts, her valuable suggestions and her supervision during the course of this study.

Special thanks and deep appreciation are also to **Prof. Dr. Magda Ahmed Fouad Shalaby**; Professor of Plant Physiology, Botany Department, National Research Centre for her suggesting the problem, sincere supervision, valuable criticism, fruitful advice and guidance through out the course of this study.

My thanks also to **Prof. Dr. Magda Mahrous Kandil** for her kind help and valuable constructive ideas.

My thanks also go to **Dr. Samia Moheb El-Khallal**; Assistant Professor of Plant Physiology, Botany Department, College of Women for Arts, Science and Education, Ain shams Univ. for her valuable remarks.

Faithful thanks to **Prof. Dr. Thoraya Rashad** Head of Botany Department, College of Women for Arts, Science and Education, Ain Shams University and **Prof. Dr. Magda Ahmed Fouad Shalaby** Head of Botany Department, National Research Centre.

My gratitude to all the staff members and colleagues of Botany Department, University College of Women for Arts, Science and Education and Botany Department, National Research Centre, Dokki, Egypt.

Dedication

*To my father's spirit,
To my mother,*

*Specially, to my husband General Pilot
Abdel Nasser who gives me all sincere love and
care,*

*To my sweet heart, my sons Omar and
Hassan who filled my life with happiness,*

*To my brother Colonel Yasser and my whole
family.*

Approval sheet
BY
Ebtihal Mohamed Abdel-Hamid

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

Dr. Tahani Abbas Hathout

Prof. of Plant Physiology,
Botany Department,
University College of Women for
Art, Science and Education,
Ain Shams University

**Dr. Magda Ahmed Fouad
Shalaby**

Prof. of Plant Physiology,
Head of Botany Department,
National Research Centre,

Dr. Magda Mahrous Kandil

Prof. of Plant Physiology,
Botany Department,
National Research Centre,

Dr. Samia Moheb El-Khallal

Assistant Prof. of Plant Physiology,
University College of Women for
Art, Science and Education,
Ain Shams University

**Head of the
Botany Department**
.....

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

إِنْ أُرِيدُ إِلَّا الْإِصْلَاحَ مَا اسْتَطَعْتُ وَمَا تَوْفِيقِي إِلَّا
بِاللَّهِ عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ

صدق الله العظيم

سورة هود (٨٨)

بسم الله الرحمن الرحيم

إِنَّا فَتَحْنَا لَكَ فَتْحًا مُبِينًا (١) لِيَغْفِرَ لَكَ اللَّهُ مَا تَقَدَّمَ
مِنْ ذَنْبِكَ وَمَا تَأَخَّرَ وَيُتِمَّ نِعْمَتَهُ عَلَيْكَ وَيَهْدِيكَ
صِرَاطًا مُسْتَقِيمًا (٢) وَيَنْصُرَكَ اللَّهُ نَصْرًا عَزِيزًا
(٣)

صدق الله العظيم

CONTENTS

	Page
Introduction	1
Review of Literature	9
- Growth parameters	9
- Metabolic activities	13
- Photosynthetic pigment contents	13
- Carbohydrate contents	17
- Nitrogenous constituents and nucleic acid contents	18
- Mineral contents	21
- Enzyme activities	22
- Endogenous growth hormone contents	24
- Yield and Yield attributes	25
- Chemicals analysis of wheat grains	28
- Aim of the study.....	31
Material and Methods	32
- Part I	
Germination	34
- Part II.....	36
- Estimation of Photosynthetic Pigments	39
- Estimation of Carbohydrates	41
- Quantitative estimation of nucleic acids in fresh plant tissue	43
- Estimation of nitrogenous constituents	45
- Assay of enzymes activities	48
- Determination of protein banding pattern	50
- Determination of certain elements	53
- Extraction Separation and Identification of Growth Regulating Substance – using HPLC	54
- Statistical analysis	57
Results	58
- Change in morphological criteria	61
- Change in photosynthetic pigments	66
- Change in carbohydrate contents	67
- Change in nitrogenous constituents and nucleic acids	67
- Change in macro-element contents	75
- Change in the enzyme activities	82

	Page
- Change in the endogenous growth hormones	87
- Change in yield components of wheat plants	87
- Change in the chemical analysis of wheat grains	98
Discussion	111
- Germination	112
- Change in morphological criteria	116
- Change in photosynthetic pigment contents	122
- Change in carbohydrate contents	124
- Change in nitrogenous constituents and nucleic acid	127
- Change in macro-element contents	130
- Change in the enzyme activities	132
- Change in the endogenous hormones	134
- Change in yield components of wheat plants	137
- Change in the chemical analysis of wheat grains	141
Conclusion	146
References	147
الملخص العربي	

List of Figures

Figures number	Figure titles	Page
Fig. (1)	Germination percentages of wheat grains treated with different concentrations of brassinolide (BR) during 7days.	60
Fig. (2)	Germination percentages of wheat grains treated with different concentrations of α -tocopherol (α -T) during 7days.	60
Fig. (3)	Change in growth criteria of wheat plants treated with different concentrations of Brassinolide (BR) at 85, 105 and 125 days from sowing (The data are per plant).	63
Fig (4)	Change in growth criteria of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85, 105 and 125 days from sowing (The data are per plant).	65
Fig (5):	Change in photosynthetic pigments content of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing.	69
Fig. (6)	Change in photosynthetic pigments content of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing.	69
Fig. (7)	Change in carbohydrate content of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg glucose /g dry wt.).	72
Fig. (8)	Change in carbohydrate content of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg glucose /g dry wt.).	74
Fig. (9)	Change in nitrogenous constituents of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg /100g fresh wt.).	77
Fig. (10)	Change in nitrogenous constituents of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg /100g fresh wt.).	79
Fig. (11)	Change in mineral content of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg /100g dry wt.).	81
Fig. (12)	Change in mineral content of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg /100g dry wt.).	84

Figures number	Figure titles	Page
Fig. (13)	Change in enzymes activities of wheat plants treated with different concentrations of brassinolide (BR) at 85 days from sowing (activity/g fresh wt./h).	85
Fig. (14)	Change in enzymes activities of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 days from sowing (activity/g fresh wt./h).	85
Fig. (15)	Change in endogenous acidic hormones of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg/100g fresh wt.).	88
Fig. (16)	Change in endogenous acidic hormones of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg/100g fresh wt.).	88
Fig. (17)	Change in endogenous phytohormones of wheat plants treated with different concentrations of brassinolide (BR) at 85 days from sowing (mg /100g fresh wt.).	91
Fig. (18)	Change in endogenous phytohormones of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 days from sowing (mg /100g fresh wt.).	92
Fig. (19)	Change in yield and yield components of wheat plants treated with different concentrations of brassinolide (BR) (Data per main spike).	93
Fig. (20)	Change in yield and yield components of wheat plants treated with different concentrations of α -tocopherol (α -T) (Data per main spike).	94
Fig. (21)	Change in yield and yield attributes of wheat plants treated with different concentrations of brassinolide (BR) (Ton/Fed.).	96
Fig. (22)	Change in yield and yield attributes of wheat plants treated with different concentrations of α -tocopherol (α -T) (Ton/Fed.).	96
Fig. (23)	Change in percentage of carbohydrates of wheat grains treated with different concentrations of brassinolide (BR) (mg/g dry wt.).	101
Fig. (24)	Change in percentage of carbohydrates of wheat grains treated with different concentrations of α -tocopherol (α -T) (mg/g dry wt.).	102
Fig. (25)	Change in nitrogenous constituents of wheat grains treated with different concentrations of brassinolide (BR) (mg/g dry wt.).	105
Fig. (26)	Change in nitrogenous constituents of wheat grains treated with different concentrations of α -tocopherol (α -T) (mg/g dry wt.).	105
Fig. (27)	Change in some macroelements content of wheat grains treated with different concentrations of brassinolide (BR) (mg/100g dry wt.).	106

Figures number	Figure titles	Page
Fig. (28)	Change in some macroelements content of wheat grains treated with different concentrations of α -tocopherol (α -T) (mg/100g dry wt.).	106
Fig. (29)	Electrograph of soluble protein pattern by one-dimensional SDS – PAGE showing the change of protein bands (marked by arrowheads) in response to brassinolide (BR) of wheat grains. Each lane contains equal amounts of protein extracted from wheat grains. Protein bands in the gel were visualized by Coomassie Blue Stain.	110
Fig. (30)	Electrograph of soluble protein pattern by one-dimensional SDS – PAGE showing the change of protein bands (marked by arrowheads) in response to α – Tocopherol (α –T) of wheat grains. Each lane contains equal amounts of protein extracted from wheat grains Protein bands in the gel were visualized by Coomassie Blue Stain.	110

List of Tables

Table number	Table titles	Page
Table (1)	Germination percentages of wheat grains treated with different concentrations of brassinolide (BR) during 7days.	59
Table (2)	Germination percentages of wheat grains treated with different concentrations of α -tocopherol (α -T) during 7days.	59
Table (3)	Change in growth criteria of wheat plants treated with different concentrations of Brassinolide (BR) at 85, 105 and 125 days from sowing (The data are per plant).	62
Table (4)	Change in growth criteria of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85, 105 and 125 days from sowing (The data are per plant).	64
Table (5)	Change in photosynthetic pigments content of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing.	68
Table (6)	Change in photosynthetic pigments content of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing.	68
Table (7)	Change in carbohydrate content of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg glucose /g dry wt.).	70
Table (8)	Change in carbohydrate content of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg glucose /g dry wt.).	72
Table (9)	Change in nitrogenous constituents of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg /100g fresh wt.).	75
Table (10)	Change in nitrogenous constituents of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg /100g fresh wt.).	77
Table (11)	Change in mineral content of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg /100g dry wt.).	79

Table number	Table titles	Page
Table (12)	Change in mineral content of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg /100g dry wt.).	82
Table (13)	Change in enzymes activities of wheat plants treated with different concentrations of brassinolide (BR) at 85 days from sowing (activity/g fresh wt./h).	85
Table (14)	Change in enzymes activities of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 days from sowing (activity/g fresh wt./h).	85
Table (15)	Change in endogenous acidic hormones of wheat plants treated with different concentrations of brassinolide (BR) at 85 and 105 days from sowing (mg/100g fresh wt.).	88
Table (16)	Change in endogenous acidic hormones of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 and 105 days from sowing (mg/100g fresh wt.).	88
Table (17)	Change in endogenous phytohormones of wheat plants treated with different concentrations of brassinolide (BR) at 85 days from sowing (mg /100g fresh wt.).	90
Table (18)	Change in endogenous phytohormones of wheat plants treated with different concentrations of α -tocopherol (α -T) at 85 days from sowing (mg /100g fresh wt.).	90
Table (19)	Change in yield and yield components of wheat plants treated with different concentrations of brassinolide (BR) (Data per main spike).	92
Table (20)	Change in yield and yield components of wheat plants treated with different concentrations of α -tocopherol (α -T) (Data per main spike).	92
Table (21)	Change in yield and yield attributes of wheat plants treated with different concentrations of brassinolide (BR) (Ton/Fed.).	95
Table (22)	Change in yield and yield attributes of wheat plants treated with different concentrations of α -tocopherol (α -T) (Ton/Fed.).	95
Table (23)	Change in percentage of carbohydrates of wheat grains treated with different concentrations of brassinolide (BR) (mg/g dry wt.).	99