EFFECT OF PUTRESCINE AND 24-EPIBRASSINOLIDE ON GROWTH, YIELD AND CHEMICAL COMPOSITIONS OF COTTON PLANT GROWN UNDER DROUGHT STRESS CONDITIONS

By

MOHAMMAD GAZY ALOBAIDY

B.Sc. Agric. Sci. (Agronomy), Fac. Agric., Aleppo Univ., Syria, 2008
M.Sc. Agric. Sci. (Plant Physiology), Fac. Agric., Cairo Univ., Egypt, 2013

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APPROVAL SHEET

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APPROVAL COMMITTEE

Dr. SAID AWAD MOHAMED SHEHATA……...……..
Professor of Plant Physiology, Fac. Agric., Ain Shams University

Dr. FARGHAL ABD-EL HAFIEZ ZEID ……..……
Professor of Plant Physiology, Fac. Agric., Cairo University

Dr. ESSAM MOHAMED ABDEL-MOATY DARWISH ……..
Associate Professor of Plant Physiology, Fac. Agric., Cairo University

Dr. AHMED HUSSIEN HANAFY AHMED ……..……...
Professor of Plant Physiology, Fac. Agric., Cairo University

Date: 18 / 5 / 2017

SUPERVISION SHEET

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Professor of Plant Physiology, Fac. Agric., Cairo University

Dr. ESSAM MOHAMED ABDEL-MOATY DARWISH
Associate Professor of Plant Physiology, Fac. Agric., Cairo University

Name of Candidate: Mohammad Gazy Alobaidy **Degree:** Ph.D.

Title of Thesis: Effect of Putrescine and 24-Epibrassinolide on Growth, Yield and Chemical Compositions of Cotton Plant Grown under Drought Stress Conditions.

Supervisors: Dr. Ahmed Hussien Hanafy Ahmed
Dr. Essam Mohamed Abdel–Moaty Darwish

Department: Agricultural Botany **Branch:** Plant Physiology

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ABSTRACT

Two field experiments were carried out in the Agric. Exp. and Res. Station as well as in the Plant Analysis Lab. of the Plant Physiol. Section, Fac. Agric., Cairo Univ., Giza, Egypt, during the two successive seasons (2014 and 2015) to study the effects of putrescine (Put) and 24-epibrassinolide (EBL) foliar applications on the growth, yield and chemical composition of Egyptian cotton (*Gossypium barbadense* L. cv. Giza 90) plants grown under drought stress conditions. The soil of the experimental site was clay loam and plants were grown under three irrigation regimes, *i.e.*, 100 % as control, 75 % and 50 % from well watering. Three different doses of Put (0, 1 and 2 ppm) or EBL (0, 10^{-9} and 10^{-7}M) were sprayed on plants; plants were sprayed five times started at the day 40 after planting and repeated every 15 days. Drought caused a significantly and gradually decreases in the growth characters, yield and its components and chemical compositions e.g., chlorophyll a, b, total chl., total carotenoids, N, P and K concentrations, activities of IAA, CK and free GAs by increasing drought level and CAT activity. While drought stress increased lint percentage, No. of falling flowers/plant, flower abscission %, total sugars, total soluble phenols, total free amino acids, proline and Na concentrations, ABA activity and antioxidant enzyme POX, PPO and SOD activities. Moreover, the mean values for relative growth rate (RGR) and net assimilation rate (NAR) tended to be lower under drought stress compared to control non-stressed plant. Applications of Put or EBL positively affected cotton growth and yield under drought stress conditions. These treatments resulted an increase in morphological characters (plant height, root length, number of leaves/plant, leaf area/plant, number of fruiting branches/plant, number of flowers/plant, shoot and root fresh and dry weight). Also, Put and EBL increase chemical constitutes related to drought tolerance either inorganic, (N, P, K and Na), or organic constitutes e.g., total free amino acids, total sugars, total soluble phenols, Chl. a, Chl. b, total Chl., total Car., antioxidant enzymes CAT, POX and SOD activities and activities of IAA, CK and free GAs while free proline, PPO activity, activity of ABA, No. of falling flowers/plant, flower abscission % as well as lint percentage were decreased. As a result of promoting growth induced by previous foliar applications, yield components e.g.; number of total, open and closed bolls, boll setting %, seed cotton yield and seed index increased. Generally, Put at 2 ppm or EBL at 10^{-7}M recorded the highest values of growth and yield characters.

Key word: Cotton, Drought, Putrescine, 24-epibrassinolide, Growth characters, Bioassay of plant hormones, Antioxidant enzymes, Plant growth analysis, RGR, NAR, Fibers quality.

DEDICATION

I dedicate this work to my mother, my father, my wife Shefaa Ahmad and my children Gazy, Tasneem and Fatema Alzahraa for their patience and help, as well as to brother, sisters and friends for all the support they hearty offered during my post-graduation studies.

Also, I proud to dedicate this work to my great country Syria, Country of the civilization and the knowledge, Castle of Lions and Kaaba of the glory and the immortality.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning of abbreviation
ABA	Abscisic acid
BRs	Brassinosteroids
CAT	Catalase
Chl.	Chlorophyll
CK	Cytokinin
cm	Centimeter
cv.	Cultivar
DAP	Day after planting
EBL	24-epibrassinoloide
EC	Electrical conductivity
FC	Field capacity
g	Gram
GA_3	Gibberellin
IAA	Indole-3- acetic acid
LSD	Least significant difference
M	Molar
mg	Milligram
mM	Millimolar
OA	Osmotic adjustment
PAs	Polyamines
PBZ	1-benzylpiperazine
POX	Peroxidase
ppm	Part per million
PPO	Polyphenol oxidase
Put	Putrescine
SOD	Super Oxide Dismutase
Spd	Spermidine
Spm	Spermine
WUE	Water use efficiency
Z	Zeatin

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