

**PHYSIOLOGICAL STUDIES ON WHEAT PLANT
IN RESPONSE TO SALT STRESS**

By

**MOHAMED MOHAMED SAAD EL-DIN ABDEL
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EL-MOHAMMADY**

**B.Sc. Agric. Sci. (Environmental Agric.), Fac. Agric., Cairo Univ., 2009
MSc. Agric. Sci. (Plant Physiology), Fac. Agric., Cairo Univ., 2014**

THESIS

**Submitted in Partial Fulfillment of the
Requirements for the Degree of**

DOCTOR OF PHILOSOPHY

In

**Agricultural Sciences
(Plant Physiology)**

**Department of Agricultural Botany
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Faculty of Agriculture
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Reviewer

Vice-Dean of Graduated Studies

APPROVAL SHEET

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Date: 9/12/2018

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Title of Thesis: Physiological Studies on Wheat Plant in Response to Salt Stress
Supervisors: Dr. Farghal Abd-El Hafiez Zeid
Dr. Ayman Yehia Amin
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ABSTRACT

A Pot experiment was carried out during seasons (2015/2016-2016/2017), designed a two-factorial factors experiment in a layout of RCBD. The study aimed to evaluate the physiological and growth responses of wheat plant subjected to different levels of diluted Mediterranean seawater salts and investigate the best strategy, which could be used to enhance salinity negative impact using either seedling priming, foliar spraying of sodium nitroprusside in concentration of 150 μ M or different potassium ferti-irrigation doses. In addition, their effect on potassium and sodium concentration distribution among wheat parts. Twenty treatments, irrigated by $\frac{1}{2}$ Hoagland strength and saline solution (ppm) (Control, 2000, 4000, 6000) and five treatments; Control, sprayed by tween 20, 150 μ M Sodium nitroprusside used as seedling priming (SNP-P) and foliar spraying (SNP-S) as well as potassium applied in two doses 50% K and 200% K. Results clearly indicated that salinity stress showed having dual impact on plant growth and yield parameters depends on solutes concentration, in which an encouraging trend was observed until 2000-ppm and adversely effect was noticed in 4000 and 6000-ppm. Potassium treatment played a role of enhancing plant water status, and it alleviate the negative impact of stress *via* adjust osmotica in whole plant cells through enhance solutes accumulation as well as its specific physiological roles in plant system. Whereas, 50% K and SNP-S showed superiority effect than 200% K and SNP-P, respectively, in which 200% K increased irrigation solution osmosity which increased plant suffer. Nitric oxide effects found to influence the place of its application, otherwise the systematic effect occurs through its cross talk with other hormones on the long term. For instance, SNP-Priming affected roots parameters and vegetative stage and SNP-S affected the foliar sprayed shoots. Furthermore, nitric oxide showed different mechanisms in enhancing plant tolerance against stress by adjusting plant osmotica and enhancing organic component metabolism other than accumulating organic solutes and ions. It enhances cycles act in ROS scavengering, defense strategies. The foliar spray of 150 μ M sodium nitroprusside (SNP-S) enhanced growth parameters, resulted higher yield components and effective organic components manipulation, higher K: Na ratio, increased enzymatic activity and non-enzymatic antioxidant capacity under higher salinity level at dilluting Mediternean sea salts to 4000-ppm

Keywords: Wheat, growth, chlorophylls, antioxidant capacity, antioxidant enzymes, Sea salts, biochemical components, yield, sodium nitroprusside, nitric oxide, potassium

DEDICATION

I dedicate this work to whom my heartfelt thanks; to my wife Shaimaa and my kids; Roqaya and Ahmed for their patience and help, as well as to my parents, sisters and my wife's family for all the support they lovely offered along the period of my past graduation.

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Indeed, I feel deeply grateful to my dear country Egypt. I believe a day will come soon, where a strong generation will come on and held my country's flag up among nations.

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