EFFECT OF SELENIUM AND BORON ON GROWTH, YIELD AND CHEMICAL CONSTITUENTS OF CANOLA PLANT (*Brassica napus* L.) GROWN UNDER SALT STRESS CONDITIONS

By

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B.Sc. Agric. Sci., (Horticulture), Fac. Agric., Ain Shams Univ., 2006
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APPROVAL SHEET

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Title of Thesis: Effect of Selenium and Boron on Growth, Yield and Chemical Constituents of Canola Plant (*Brassica napus* L.) Grown Under Salt Stress Conditions
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Department: Ornamental Horticulture **Approval: 6 / 12 / 2017**

ABSTRACT

Salinity is a major factor that influences rapeseed production. Canola is now the third most important source of edible oil in the world. Selenium and boron are required by plants in small quantities that involve several physiological and biochemical processes in plants and enhanced salt tolerance of plants.

This study was carried out at the Department of Ornamental Horticulture, Faculty of Agriculture, Cairo University. The experiments were conducted at the National Research Centre, Dokki, Cairo, Egypt during the two successive seasons of 2012/2013 and 2013/2014 to evaluate the effect of salinity (0, 2.5, 5 and 7.5 dS m^{-1}), selenium (0, 2 and 4 mg Se l^{-1} as sodium selenat) and boron (0, 2 and 4 mg B l^{-1} as boric acid) and their interactions on growth, yield and chemical constituents of canola plant.

The results showed that the lowest level of salinity (2.5 dS m^{-1}) resulted in the maximum values of plant height, number of branches, number of leaves, number and weight of siliquae, leaf area, herb fresh and dry weight, seeds weight, oil content, photosynthetic pigments, total soluble phenols, total free amino acids and protein as well as nitrogen, phosphorus, potassium, calcium and boron concentrations. Moreover, salinity at 5 dS m^{-1} recorded the greatest values of relative concentration of Oleic acid and Stearic acids. While, increasing salinity up to 7.5 dS m^{-1} gave the maximum values of relative concentration of Linoleic acid, cis-11-Eicosenoic acid and Erucic acid and produced the greatest concentrations of total sugars, proline, nitrate, magnesium and sodium.

The addition of 2 mg l^{-1} of selenium combined with 4 mg l^{-1} of boron recorded the highest herb dry weight, siliquae weight, photosynthetic pigments and increased Oleic acid relative concentration. While, increasing selenium up to 4 mg l^{-1} combined with 4 mg l^{-1} of boron gave the highest herb fresh weight, total sugars and total free amino acids concentrations.

The plants irrigated with 2.5 dS m^{-1} and sprayed with 2 mg l^{-1} of selenium combined with 4 mg l^{-1} of boron produced the highest values of plant height, herb dry weight, oil percentage and increased relative concentration of Oleic acid oil seeds of canola (75.6 %) and decreased Linoleic acid (11.2 %). While, with 4 mg l^{-1} of selenium combined with 2 mg l^{-1} of boron gave the maximum values of herb fresh weight, seeds weight, oil content, oil antioxidant activity and photosynthetic pigments.

The results revealed that the major monounsaturated fatty acids was Oleic acid (46.2 - 75.6 %), followed by cis-11-Eicosenoic acid (1.4 - 11.5 %) and Erucic acid (0.8 - 10.8 %). Linoleic acid (11.2 - 24.8 %) was the main component of polyunsaturated fatty acids. Whereas the main saturated fatty acids were Palmitic acid (1.0 - 5.0 %) and Stearic acid (1.4 - 3.0 %).

Keywords: *Canola, Salinity, Selenium, Boron, Fixed oil, Chemical constituents.*

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DEDICATION

I am thankfully dedicating this thesis to

Spirits of my ***grandfathers and grandmothers****, specially my* ***maternal grandfather*** *whose supportive words are still ringing in my ears.*

My beloved ***parents*** *who are the source of giving, encouragement and advice throughout my life and their help in everyway eases all difficulties.*

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LIST OF ABBREVIATIONS AND INITIALS

Abbreviation	Meaning of abbreviation
BC	Before Christ
Chl.	Chlorophyll
cm	Centimeter
C/N	Carbon/Nitrogen
DNA	Deoxyribonucleic acid
dS m^{-1}	DeciSiemens per meter
Ec	Electrical conductivity
e.g.	*exempli gratia* (for example)
FAO	Food Agriculture Organization
g	Gram
GC-MS	Gas Chromatography-Mass spectrometry
ha	Hectare
i.e.	*id est* (that is)
kg	Kilogram
l	Liter
LSD	Least significant difference
m	Meter
mg	Milligram
mM	Milli-Molar concentration
N.R.C.	National Research Centre
pH	Potential Hydrogen
ppm	Part per million
RNA	Riboside Nucleic Acid
ROS	Reactive Oxygen Species
U.S.A.	United States of America
UV	Ultra violet
w/v	Weight/volume

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